

NETWORK WORLD

THE WEEKLY FOR LEADING USERS OF COMMUNICATIONS PRODUCTS & SERVICES

VOLUME 4, NUMBER 38

SEPTEMBER 21, 1987

► NORTHERN TELECOM

Northern broadside targets private nets

Meridian Customer Defined Networking scheme provides ISDN signaling, easier management.

BY MICHAEL FAHEY
Senior Writer

NEW YORK — Northern Telecom, Inc. last week unveiled Meridian Customer Defined Networking, a broad array of products, services and applications designed to allow Fortune 200 companies to build large, customized corporate networks using services and equipment supplied by

a variety of vendors.

The announcement fulfills the company's promise to provide a corporate version of SuperNode for telephone companies announced in July. In addition, the company announced new tandem network software and Integrated Services Digital Network-compatible interfaces for the SL-1 and SL-100 as well as a network

management system that can control a range of wide-area network equipment.

"Every division in the company was involved with this announcement," said Roland Zalite, director of strategic marketing for Northern Telecom's Networks division.

Meridian Customer Defined Networking, which the company said will be
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► REACTION

Greene ruling wins approval of users

BY KARYL SCOTT
Washington, D.C. Correspondent

WASHINGTON, D.C. — User reaction last week was decidedly favorable to U.S. District Court Judge Harold Greene's Sept. 10 ruling on proposed changes to the Modified Final Judgment — a decision that gave the regional Bell holding companies little new freedom. But in the area of information services, Greene's ruling raised as many questions as it answered.

"We concur with Judge Greene's reasoning and feel his go-slow approach to freeing the RBHCs is a wise one," said Kenneth Phillips, chairman of the Corporate Committee of Telecommunications Users and vice-president of telecommunications policy at Citicorp.

As part of a triennial review of the Modified Final Judgment, Greene refused to lift current prohibitions that bar the RBHCs from offering long-distance service and
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► DATA STRATEGIES

ISDN ventures into local net territory

BY PAULA MUSICH
Senior Editor

As users sift through the promises surrounding Integrated Services Digital Network standards, some are questioning whether ISDN can serve their local data communications needs as well as, or better than, local-area networks.

Despite ISDN's potential to eliminate the need to install
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SERVICE FOCUS

Tariffed, nontariffed options produce T-1 market turmoil

BY ROBERT ELLIS
Special to Network World

Nearly every manager has heard tales of gloom and doom from AT&T's major competitors in the low-end telecom services market, where cutthroat competition has slashed profit margins on basic

long-distance services.

Now, competition also has become unmistakably vigorous, if at times unruly, at the high end of the market: the specialized business of selling high-capacity digital channels, or T-spans, which support transmission speeds of 1.54M bit/

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NETWORK LINE

News

► Users heading for next week's Tele-Communications Association conference in San Diego will get an earful on bottom-line management issues. Page 2.

► It's a catch-22 for ISDN, say ICC-ISDN '87 speakers. Users won't buy it until they know the price, and vendors can't price it until

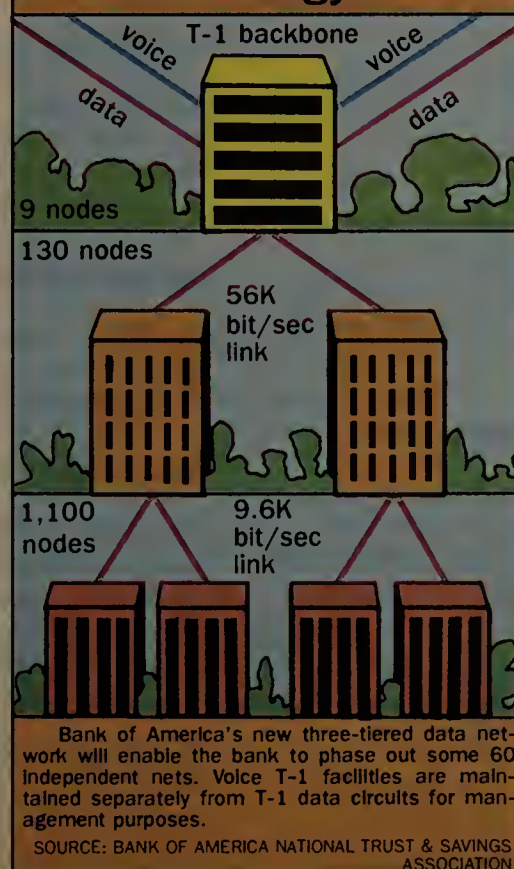
they can gauge customer interest. Page 2.

► Codex unveils a net management system that will evolve to handle gear from many vendors. Page 4.

Features

► Behind the emergence of today's T-1 multiplexer vendors lies a saga of how power, personalities and money fueled three start-ups and forever changed the industry. Page 29.

Bank of America's network consolidation strategy



► MANAGEMENT

Bank untangles network mess

Bank of America overhauls architecture, merges nets.

BY PAUL KORZENIOWSKI
Senior Editor

CONCORD, Calif. — After struggling with a communications strategy that spawned a confusing jumble of incompatible networks, Bank of America National Trust & Savings Association revamped its network architecture and is now in the process of consolidating its vast array of voice and data networks.

The three-tiered voice and data networks the bank is currently installing replace an antiquated private voice network and more than 60 incompatible data networks in California, enabling the bank to move from a reactive networking posture to a proactive stance.

The ambitious network project began three years ago, when the bank took a close look at its
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► TCA PREVIEW

TCA sessions will offer bottom-line strategies

Speakers focus on management issues.

BY JOSH GONZE
Staff Writer

SAN DIEGO — Managers attending the Tele-Communications Association's (TCA) 25th Annual Conference and Exhibition, slated to get under way here next week, will benefit from a number of sessions that focus on the bottom-line aspects of communications, show promoters said.

In addition, TCA's lineup of about 20 sessions will offer direction on key technological issues such as bypass, customized wiring schemes and private branch ex-

change implementation.

TCA will officially kick off the show with a keynote speech titled "Telecommunications: Closing the Distance" by James Lovell, a for-

For a preview of TCA product unveilings, see related story on page 53.

mer astronaut and current president of Centel Communications Co., which installs business telephone and cable television systems.

Roughly 15,000 attendees are expected during the four days of the show, including 1,200 TCA

members, according to Conference Vice-President Marty Hill.

One of the show highlights will be a demonstration of IBM's NetView/PC. According to a source close to IBM, five to 10 vendors will demonstrate how their products work with IBM's NetView/PC during a demonstration held in conjunction with IBM.

In addition, attendees will find roughly 250 vendors exhibiting existing products and services and announcing new wares. Most of the big names in the industry have reserved booth space, including IBM, AT&T, Rolm Corp., Northern Telecom, Inc., Timeplex, Inc. and Network Equipment Technologies, Inc. Noticeably absent from the show floor will be Digital Equipment Corp. and Wang Laboratories, Inc.

"Attendees will have an amazing opportunity because they'll have 250 vendors there with working products," TCA Chairman
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► ICC-ISDN '87

Users not rushing into ISDN

They question need for future services.

BY BOB WALLACE
Senior Editor

DALLAS — Users told carriers and equipment makers last week that Integrated Services Digital Network offerings will not play a big part in their networking strategies because of the lack of information on ISDN service availability and pricing.

Gathered at the International Council for Computer Communication (ICCC)-ISDN '87 conference here, users, local and long-distance carriers and hardware suppliers described a catch-22 dilemma hindering deployment and use of ISDN services in the U.S.

Asked by vendors if they will use proposed ISDN services, users said they have to know how much they will cost and when they will be available. But carriers say they can't set prices or rollout schedules until they determine how heavily the services will be used.

Several major users attending the conference, including American Airlines, Inc., The Hartford Fire Insurance Co., Textron, Inc. and Travelers Insurance Co., described ISDN as a solution that may be in search of a problem. The users told *Network World* they are not certain how ISDN services would reduce communications costs or enable their companies to offer a wider variety of communications services.

Investment analysts at the show also raised questions about ISDN (see "Potential users wary of ISDN," *NW*, page 8).

Gary Shipley, communications project manager for H.E. Butt Grocery Co., a 150-store grocery chain based in San Antonio, Texas, said he did not know of applications ISDN technology could enhance. "The vendors are designing what they think are the services we need without really understanding how we do business," he said. "I don't see the benefits of ISDN. They have to find applications for this technology, or it will turn out to be a big catastrophe."

"I'm trying to sell groceries,"
See page 6

► NETWORK MANAGEMENT

Codex unveils integrated net manager

BY PAUL KORZENIOWSKI
Senior Editor

CANTON, Mass. — The integrated network management market was further splintered last week when Codex Corp. unveiled a product designed to control its own and other vendors' networking wares.

The Codex 9800 Integrated Network Management System (INMS) will ultimately enable a network operator to manage a variety of network equipment, such as multiplexers, modems, X.25 packet assembler/disassemblers and private branch exchanges, from a central point. The \$61,900 system is based on an Apollo Computer, Inc. Domain workstation with a 155M-byte disk drive.

Codex is taking a piecemeal approach to enabling its product to work with different network devices. The first release of the product, which will be sent to beta sites in the first quarter of next year, will manage only Codex's 6700 and 6000 series statistical multiplexers. By the end of the first quarter, the company said, the product will be enhanced to control Codex diagnostic modems as well.

By the end of next year, Codex said, the 9800 INMSs will be able to control Codex's X.25 networking products, its 4000 series local networks and its high-end T-1 multiplexer, which is supplied by StrataCom, Inc.

Codex has adopted a two-

pronged strategy for bringing other vendors' wares under the aegis of the 9800 INMS. Codex said it will work with a select group of vendors to link their systems with the 9800 INMS. Officials said Codex is currently working with a half-dozen vendors, but would name only StrataCom.

In addition, Codex said the 9800 INMS conforms with emerging International Standards Organization Open System Interconnect (OSI) network management standards and will exchange information with other systems conforming to those standards. But analysts said the OSI standards are years away

from completion, and, while other vendors have said they will follow the net management reference model, there currently is little support for the standards.

Codex officials said the 9800 INMS provides customers with a global view of their networks. For example, the system depicts communications lines and equipment in a customer's network on a multi-colored map, alerting users to network problems through color changes.

An operator can focus on a trouble spot, obtaining information about it with a mouse interface.
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NEW PRODUCTS AND SERVICES

Digital Sound unveils a low-end version of its VoiceServer voice application processor as well as software that links 40 remote VoiceServers via dial-up or leased lines. **Page 23.**

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Network World wants to make its news coverage even better, and for that we ask your help. If you know of an interesting event that just occurred or is about to occur, please call. We'd also like to know how you optimize your networks. Call Editor Bruce Hoard toll free at (800) 343-6474.

Clarification: Based on information from Mitel, Inc., the story, "Mitel's 0% finance plan bows," *NW*, Sept. 7, stated that when a lease for private branch exchange equipment is paid out, under Mitel's new finance plan, the customer owns the equipment. Mitel said the user actually has the option of purchasing, returning or renting it.

► CORPORATION FOR OPEN SYSTEMS

COS wins new recruits

BY KARYL SCOTT
Washington, D.C. Correspondent

MCLEAN, Va. — Officials at the Corporation for Open Systems (COS) last week announced that Bell Atlantic Corp. and Vance Computer Systems, Inc. will join the standards group, although negotiations with both recruits are still under way.

At a press conference here, COS officials also introduced five Open Systems Interconnect (OSI) software testing products that will be available by the end of the year.

COS is a nonprofit consortium of 65 computer and communications companies and 19 user affiliates that was founded in January 1986 to develop tests for product interoperability.

Philadelphia-based Bell Atlantic, the third regional Bell holding company to join COS, plans to finalize its membership soon, Chief Executive Officer Thomas Bolger said at the International Council for Computer Communication's Integrated Services Digital Networks '87 conference in Dallas. Pacific Telesis Group and Nynex Corp. are already COS members.

Bell Atlantic is expected to join as a senior research member, the highest level membership in COS. Pacific Telesis and Nynex are also senior research members, each paying \$200,000 annually for membership.

"We understand how important universal communications standards are, and to help further this goal Bell Atlantic will soon join COS," Bolger said.

Vance Computer Systems of Chantilly, Va., is a supplier of OSI conformance testing systems and is supplying COS with hardware products that will run some of the group's testing software. "We've been closely aligned with COS, so membership was a natural development for us," said Vance President William Livingston. The company is joining as a so-called regular member of COS and will pay an annual fee of \$25,000.

One of the five testing products COS announced, the Transport Protocol Test System, actually began shipping last month ("ICA, others join COS; group to ship test tool," NW, Aug. 10). COS Chief Executive Officer Lincoln Faurer said release of the product represented the first step toward achievement of the group's goal of "accelerating the introduction of multivendor, interoperable products compliant with OSI and other international standards."

The first recipients of the product are COS members who will participate in the June 1988 Enterprise Networking Event in Baltimore, a demonstration of multivendor equipment interoperability sponsored by the Manufacturing Automation Protocol/Technical and Office Protocol Users Group, the National Bureau of Standards OSI Workshop and COS members.

Other testing products introduced this week included the 802.4 Token Bus test system, which will be sent to COS members beginning in October; the Internet Protocol and the File Transfer and Access Management (FTAM) Protocol test systems, scheduled for November release; and the Message Handling System (MHS) Protocol test system, which is scheduled to ship in December.

The Transport Protocol tester runs on a Sun Microsystems, Inc. Sun-3/160 workstation and enables vendors to test their commu-

nications products for conformance to the OSI Transport Protocol standard, which corresponds to Layer 4 of the OSI model.

The Token Bus tester will test products for conformance to Layers 1 and 2 of the OSI model, the physical and data link layers, respectively.

These layers describe the physical connection of equipment to the network and the electrical signals that transmit data.

The Internet Protocol software will test a product's conformance to Layer 3 of the OSI model. The Internet Protocol defines the manner in which information is sent over the network and includes the addressing of packets of information.

The remaining test products, MHS and FTAM, are both application-layer protocols corresponding to Layer 7 of the OSI model. Both MHS and FTAM test systems will contain Layer 5 and 6 protocol specifications. Layer 5, or the session protocol, and the Layer 6 reliable transfer protocol help establish communications between two networked devices, such as a host and a personal computer, working on the same application, such as file transfer.

The test software was developed in conjunction with the National Computer Center in the UK. COS will begin certifying products around mid-1988, Faurer said. Products that pass COS testing will be affixed with the COS seal. □

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► FRONT-END PROCESSORS

Amdahl 4725 FEP out

BY JIM BROWN
New Products Editor

SUNNYVALE, Calif. — Years behind chief rival IBM, Amdahl Corp. last week introduced its long-awaited IBM 3725-compatible front-end processors.

Amdahl attributed the delay in the debut of its two new front-end processors, the 4725-30 and the 4725-40, to the design of a new chip set used to increase performance compared to the firm's 4705, an IBM 3705-compatible processor.

The new chips increase the 4725-40's throughput to and from host processors by 80%, compared with the older 4705, and 20% for the 4725-30, said Tim Logan, Amdahl's director of communications products. The set uses emitter-coupled logic, the same chip design used in Amdahl's fastest mainframes, Logan said. "It took time to adopt this type of technology."

Analysts who have been waiting for Amdahl to respond to IBM's introduction of the 3725 in 1984 said Amdahl's development efforts

were slowed further by revisions to IBM's Network Control Program (NCP). In the last 18 months, IBM has released three new versions of NCP, the software that operates front-end processors.

"I actually thought Amdahl would announce a 4725 a lot sooner," said Gigi Wang of The Yankee Group, a Boston consulting firm. But since Amdahl's products run IBM software, Amdahl had to ensure the new models could run the latest versions of NCP, she said.

The 4725s replace the Amdahl 4705. The new front ends have 512K bytes to 3M bytes of main memory, and the base configuration of both models supports up to 128 full-duplex communications lines, expandable to 256. The units support up to six host links.

Both units support line speeds of up to 256K bit/sec. Future 4725 models will support IBM's Token-Ring local network, a capability already provided by IBM's 3725.

An operator console attached to either model displays system status information from an internal maintenance and operator subsys-

tem designed to diagnose communications problems. Amdahl also allows users to link the new models to the Amdahl Diagnostic Assistance Center, a service offering users on-line technical support.

"Everyone has been predicting that Amdahl would come out with a new model," said David Passmore, a principal of Fairfax, Va.-based consulting firm Network Strategies, Inc. "Since IBM has stopped releasing NCP software for the 3705, you have all these Amdahl 4705 users out there in the same boat as IBM 3705 users."

According to Logan, "We could have come out with a box sooner, but it would not have had the performance capability we felt was required." He acknowledged that IBM's new NCP versions contributed to the delay but said the chip design required more effort.

"The difficulty we ran into was not totally due to radical changes to NCP. The difficulty was designing a high-performance product we would be able to live with for a considerable length of time."

Pricing ranges from \$71,500 for the low-end Amdahl 4725-30 to \$545,160 for the 4725-40. Designed by Amdahl, the units will be manufactured by Fujitsu Ltd. in Japan. □

Greene ruling wins approval

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manufacturing equipment. While saying the RBHCs cannot offer information services, such as data base services, he said they can provide transmission for other information service providers. On the upside, Greene gave the companies approval to enter nontelephone businesses without permission from the court.

Despite the apparent thoroughness of Greene's 223-page order, regulatory experts raised questions about the specific transmission services the RBHCs will be allowed to provide and whether the information service provision negates Federal Communications Commission Third Computer Inquiry rules. Observers wondered whether voice messaging and other advanced services would be allowed under Greene's ruling.

Greene asked the RBHCs and other parties to file comments on implementation of the information service provision by Sept. 30. After reviewing these plans, Greene will issue a final order outlining the information-related services the RBHCs can market.

"It's appropriate that Greene has prohibited the RBHCs from the provision of data base services at this time, but Greene needs to clarify his order to prohibit the RBHCs from forming subsidiaries to market data base services," Phillips said.

In his order, Greene said, "If the regional companies could sell information in competition with providers of these services, their control of the network would give them the ability to discriminate against competitors. That does not

mean that the public must be deprived of the revolutionary changes that are possible if information can be made available to vast numbers of consumers by means of the telephone network."

Greene said the RBHCs can provide basic data transmission functions such as signal modulation, error rate measurement, protocol conversion, address translation and character generation for information service providers. The RBHCs will also be allowed to handle billing chores for information service providers.

"The judge's order is very narrow in the type of information transmission services the RBHCs can market," said James Blaszak, attorney for the Ad Hoc Telecommunications Users Committee. "It doesn't really seem as if he's letting them provide any functionality they can't already offer."

Questions arose over whether Greene's order will enable the RBHCs to go forward with plans to market voice-messaging services under the FCC's Comparably Efficient Interconnection (CEI) rules.

"CEI is dead as a result of Greene's order," said Peter Bernstein, senior research analyst at Probe Research, Inc. in Morristown, N.J. "CEI was the FCC prerequisite for letting the RBHCs into information services. Now Greene says they can't get into information services. Why would the RBHCs want to make their network facilities available to their competitors if they can't provide information services?"

Peter Huber, special consultant to the Department of Justice and author of the Justice Department report on competition in the telephone industry told *Network World*, "If you read the broad lan-

guage in the judge's order, it would appear that voice messaging is allowed. Then again, if you read the narrower language, it's not at all clear that Greene intends to allow the RBHCs into this area."

Apart from the information services issue, most observers were satisfied with Greene's action. International Communications Association attorney Brian Moir said his user constituents were pleased with the decision, which, he said, "balanced the need for consumer protection against RBHC monopoly power with the desire to foster the development of new services."

Interexchange carriers, equipment manufacturers and information service providers all expressed their support for Greene. "Judge Greene stood firm to bring order and progress to the telecommunications industry and the public," said Jerry McAndrews, president of the Competitive Telecommunications Association, which represents interconnects.

Even the RBHCs, which initially expressed militant opposition to Greene's ruling, seemed to soften last week.

"While our initial reaction was one of outright disappointment, we are beginning to realize Greene's order means the door to new opportunities is beginning to open slightly," said Bell Atlantic Corp. spokeswoman Patti Reilly.

For some, the strategy behind Greene's ruling was clear. "Greene took the long-term view on monopoly regulation and rightly so," said Doane Perry, a telecommunications analyst at International Data Corp., in Framingham, Mass. "He decided the orderly regulation of a monopoly industry is more important than the development of a single service or business." □

NETWORK WORLD

An IDG Communications Publication

Box 9171, 375 Cochituate Road
Framingham, Mass. 01701-9171
617-879-0700

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Second-class postage paid at Framingham, MA, and additional mailing offices. *Network World* (USPS 735-730) is published weekly, except for a single combined issue the last two weeks in December by CW Publishing/Inc., 375 Cochituate Road, Box 9171, Framingham, MA 01701-9171.

To apply for a free subscription, complete and sign the qualification card in this issue or write *Network World* at the address below. No subscriptions accepted without complete identification of subscriber's name, job function, company or organization. Based on information supplied, the publisher reserves the right to reject non-qualified requests. Subscriptions: 1-215-630-0500.

Non-qualified subscribers: \$3.00 a copy; U.S. — \$95 a year; Canada, Central & South America — \$110 a year; Europe — \$165 a year, all other countries — \$245 a year (airmail service). Four weeks notice is required for change of address. Allow six weeks for new subscription service to begin. Please include mailing label appearing on front cover of the publication.

Network World can be purchased on 35mm microfilm through University Microfilm Int., Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich. 48106.

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Users not rushing into ISDN

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Shipley added. "I want to know how using ISDN will reduce our communications costs or enable us to offer new services to our customers."

ISDN is designed to provide users with the ability to transmit voice and data simultaneously over existing telephone facilities. Although several regional Bell holding companies, such as US West, have begun internal or field trials of ISDN services, the services are not expected to be commercially available until sometime next year.

Carriers attending the meeting said they must show users how ISDN can advance their communications strategies and should shift their focus from developing ISDN technology to meeting the needs of their customers. Bell Atlantic Corp. Chief Executive Officer Tom Bolger, who delivered the meeting's keynote speech, said, "We have not been user-oriented, we have been technology-oriented. We have to find out what users want and what they are willing to pay for and plan accordingly."

"Users must tell us what they want," Bolger added.

Sherman Murphy, assistant secretary and director of communications technology for The Hartford, an 18,000-employee insurance company with 1986 revenue of \$8 billion, agreed that vendors do not understand yet how customers will use ISDN services. "Vendors have little perception of what their customers need," he said. "We are not waiting for ISDN. Users don't seem to be too excited about it."

"Besides, I want to see the price tag first," he said.

Travers Waltrip, data processing manager for the Travelers and a member of the ICC-ISDN '87 program board, said the availability of cheap, high-speed transmission services and users' predisposition toward private nets takes much of the luster from ISDN. "Most large users believe DS1 and DS3 services have already become commodity items," he said. "Users are using these services with intelligent multiplexers to create de facto ISDN networks. Fiber has

changed everything around. The cost of high-speed digital transmission services is dropping. How can ISDN compete?"

Roy Brunson, communications engineering project engineer for American Airlines, said the popularity of T-1 services could spell trouble for those planning to peddle ISDN services. "I hear all this talk about ISDN's Primary Rate Interface. Well, T-1 is already giving us 24, not 23, channels per link."

Brunson said he did not know if ISDN services could be used with the airline's nationwide Sabre reservations net, which handles 65 million calls annually, or the company's second voice net, which serves four corporate locations, 115 airports, ticket offices and other sites.

"I want to hear about ISDN features and functions, when they will become available and how much they will cost," Brunson said. "We will undoubtedly add ISDN to the list of communications services we use, but when and to what extent it will be used is unknown."

Brunson said American Airlines prefers to use private, dedicated

facilities to carry high volumes of traffic on its nets. "Public switched offerings are not cost-effective for this amount of traffic," he noted.

"I have difficulty embracing ISDN as a solution for our future communications needs," Brunson said. "Although it may someday replace the switched services we use, the private network option usually wins."

Jim Wells, MIS director for Textron's Gorham precious metal manufacturing division, said his company uses a leased-line net to carry voice traffic between sites. He said Textron, a conglomerate with 35 divisions that are all free to purchase their own communications services and gear, would not be a candidate for ISDN services.

"ISDN cannot work in an environment like ours, where our communications needs are so fractured," Wells said.

Wells said vendors are not adequately addressing major users' concerns about ISDN. "Everyone has skirted discussion of how much ISDN services will cost," he maintained. "I don't see where this technology will fit." □

Bank untangles network mess

continued from page 1

voice and data support. What it saw was an incoherent set of networks that frustrated employees and customers and hindered rather than helped the bank achieve business objectives. John Marci, vice-president of regulatory and tariff matters at Bank of America, said the company's private voice net was so poorly designed that employees often bypassed it and used outside lines for internal calls.

The company's data networks were just as ineffective. "In the halcyon days of the bank, whenever a department wanted a new data network, it simply designed and installed it," Marci said.

Consequently, the data networks supported a variety of incompatible communications protocols, such as Binary Synchronous Communications, asynchronous and a few protocols the bank developed itself. Whenever a user called the company's network control center with a problem, chaos ensued because there were no network management tools capable of monitoring every network and protocol, according to Marci.

In addition to being difficult to manage, the data networks could not adequately support a number of customer service applications. "Last year, you could walk downtown any time during the day and see at least 10 customers in line at a teller window," Marci said. Tellers were unable to serve customers quickly because they had to wait at least 10 to 15 seconds for the bank's computer systems to complete each transaction.

The network also hobbled the bank's ability to respond to bank deregulation. "Each time we wanted to install a new application, we had to design a new network from scratch," noted Bruce Fadem, se-

nior vice-president at the bank.

Realizing the bank could not continue on that course, the bank's communications managers sat down to craft a blueprint that would solve the myriad problems and position the company to take advantage of future technical developments. "There weren't any clear solutions or any books we could open and simply follow a proven recipe," Fadem said.

For two years, bank officials examined the pluses and minuses of several network alternatives. Their work attracted the attention of leading vendors, such as IBM and AT&T, which tried to align themselves with the bank, one of the nation's largest communications users. "We changed our minds many times as we more clearly understood our needs and the promise of various technologies," Fadem said.

Last summer, Bank of America finally outlined its intentions, which included plans to install separate voice and data T-1 backbone networks in California, thereby limiting the bank's role in testing unproven technologies, handing over backbone network management tasks to a single vendor and establishing IBM's LU 6.2 protocol as the standard communications protocol for all new applications.

The voice and data networks are similar in design and based on a three-tiered approach. Roughly 1,100 remote branch locations are connected to 130 branches designated as concentration points, which are in turn linked to one of nine larger branch offices. These nine branch offices are linked by a T-1 backbone network consisting of facilities dedicated to voice and others used solely for data.

Bank of America decided to keep

its voice and data networks completely separate because it did not believe there were adequate tools available to manage integrated networks. "We think there will be another generation of T-1 multiplexers that will have better network management capabilities than the current products have," Marci said. Although the bank knew that new voice and data management tools were coming, it did not want to have to develop its own for use in the interim. "We decided to pull back and not be an inventor because we have a big enough job rolling out the separate networks," Fadem said. Integrating voice and data would add another level of complexity to a project that already required installing 115 T-1 lines for voice and 19 T-1 lines for data, he said.

"We've moved away from an R&D philosophy," Fadem said of the decision to abandon the practice of working with vendors to test emerging technologies. "One can become enthralled with a technology, spend millions of dollars to make it work and find it has no relationship to any business need."

The department decided to job out management of both networks to AT&T, which acts as a single point of contact for problems, although the network uses equipment and services from other vendors including IBM, Network Equipment Technologies, Inc., Pacific Telesis Group and US Sprint Communications Co. "We looked at maintaining the equipment ourselves but thought it would cost us money," Marci said. "We would have had to place technicians at each of the sites. Technicians, especially data technicians, are expensive."

The network overhaul, which began last summer, turned up some problems that had to be solved before the backbone networks can be

completed, a process that will run until the end of 1988.

To meet an urgent need to improve computer response time for branch office systems, the bank took what Marci called a "meat-ax" approach to the problem; it simply doubled the number of circuits used to support each branch. For about nine months, the interim step worked well, and teller lines dwindled. The bank may double that number again in the next few months to meet demand generated by new customers.

The bank is also modifying its plan as it is implemented. Marci said the bank spends more than \$15 million a year for WATS services to enable merchants to dial into Bank of America's central processing facility here to verify point-of-sale transactions.

Bank of America now plans to replace the WATS lines with dial-up connections to branch locations near the merchants and route the calls over the company's private network. That could reduce the cost of processing transactions from 18 cents to 10 cents per transaction, the bank estimates.

Once the California networks are finished, the bank intends to extend its reach to other domestic sites, such as Miami, New York and Chicago. There is also a possibility of extending the network to international locations.

Despite the massive overhaul, Fadem said the communications department met all of its goals in 1987 and expects to do so in 1988. In June, the bank moved the first application that uses IBM's LU 6.2 out of a test mode and into a production environment. The application enables employees at a service center in Pleasant Hill, Calif., to access and download customer information stored on an IBM mainframe to IBM Personal Computers on IBM Token-Ring Networks. □

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► ICC-ISDN '87

Investment companies wary of ISDN

BY BOB WALLACE
Senior Editor

DALLAS — Representatives of some of the country's premier investment companies said last week they are wary of financing Integrated Services Digital

Network projects because of limited user interest in the technology.

Speaking at the International Council for Computer Communication's ISDN '87 conference here, William Becklean, vice-president of Kidder, Peabody &

Co. in Boston, painted a grim picture of ISDN's future.

"By the time ISDN becomes commercially available, vendors will probably find that 199 of the Fortune 200 corporations are already running private,

ISDN-like networks."

He said savvy communications managers are not waiting for ISDN services and equipment to make it to market but are already finding ways to construct advanced nets.

Unwillingness on the

part of investment companies to lay out capital for vendors' ISDN product and service development projects could slow the deployment of the technology. Many of these companies rely on outside capital to fund their research and development efforts.

Another elegant solution

"ISDN is pitched to you by the same people who brought you the Picturephone, digital termination systems, Net 1000 and integrated voice and data workstations," Becklean said.

"All were technically elegant solutions in search of problems," he continued. "We are always ready to finance a telecommunications enterprise, but please don't give us another turkey. We need to know if ISDN services will fit the needs of the user and be

"ISDN is pitched to you by the same people who brought you the Picturephone, digital termination systems, Net 1000 and integrated voice and data workstations," William Becklean said. "We are always ready to finance a telecommunications enterprise, but please don't give us another turkey."

cost-effective."

Anna Kovacs, an analyst with Eaton Vance Corp., said she feared federal and state regulators may retard the spread of ISDN by over-regulating services. "ISDN could be delayed several years before regulators realize they are killing the technology," she said.

An unclear picture

Becklean said research has shown users do not have a clear picture of what ISDN is and how it can be used.

"It seems we are not the only ones who are confused about ISDN," he said. "That gives investment bankers reason for concern. If prospective ISDN users don't know what ISDN is, who does?"

The investor assailed those who make customer premises equipment and sell communications services for failing to address how customers can use ISDN. "Vendors are interested in what the technology does but don't understand what customers want." □



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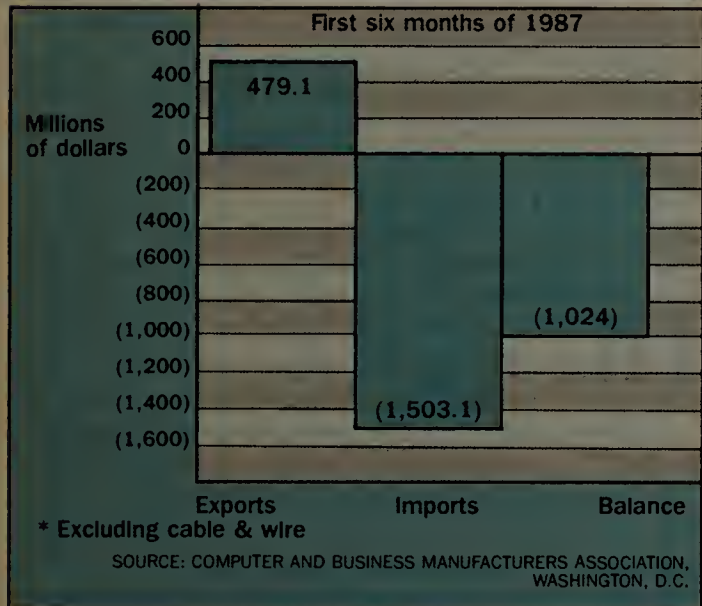
Harrison

INDUSTRY UPDATE

Harris to market Proteon ProNET products

Proteon, Inc. signed an OEM agreement with Harris Corp. under which Harris will market ProNET token-ring networks and gateway products. Proteon officials, calling the agreement "an important step toward building an OEM base," value the contract at about \$2.5 million.

Telecommunications equipment trade*



REGULATION

Justice defers ruling on SW Bell buyout of firm

Acquisition of R&D company may have violated MFJ.

BY KARYL SCOTT

Washington, D.C. Correspondent

WASHINGTON, D.C. — The U.S. Department of Justice last week deferred its decision regarding the legality of Southwestern Bell Corp.'s secret 1985 acquisition of communications start-up Tsunami Technologies Corp., saying it needs more time to investigate whether the purchase violated regulations.

In comments filed with U.S. District Court Judge Harold Greene, the Justice Department reported it had found "significant lapses in Southwestern Bell's compliance with the MFJ requirement that all RBHC officers and management employees be informed about their decree obligations." The Justice Department told Greene it needs more time to "investigate the extent of Southwestern Bell's noncompliance."

The Justice Department investigation was sparked by former Tsunami Chief Financial Officer Donald G. Marquart, who claimed that Southwestern Bell violated the manufacturing restriction of the Modified Final Judgment when it bought the research and development company for \$11.8 million. Southwestern Bell has denied the allegation.

The Modified Final Judgment requires the regional Bell holding companies to inform top level managers of the decree restrictions on telecommunications equipment manufacturing as

well as the prohibition on the provision of long-distance and information services.

The RBHCs are prohibited under the Modified Final Judgment from manufacturing telecommunications gear and owning manufacturing companies. The Modified Final Judgment is the antitrust law that has governed the RBHCs since the breakup of the Bell System.

Marquart claimed he was fired in August 1986 after discussing the issue of Modified Final Judgment violations with Tsunami officials. Marquart subsequently notified the government of his worries in a March 1987 letter to the Justice Department and an August letter to Judge Greene. Marquart said neither Southwestern Bell nor Tsunami officials ever discussed Modified Final Judgment rules when the acquisition was taking place.

"The officers and investors of Tsunami, including Mr. Marquart, were aware of the decree from the beginning of their negotiations with Southwestern Bell and were informed thereafter by their own counsel regarding the potential impact of the decree on Tsunami," according to a Southwestern Bell Sept. 2 filing with the Justice Department.

"Southwestern Bell scrupulously worked with Tsunami's founders to redirect the venture's business plan so as to comply with the MFJ. Mr. Marquart and the other founders ac-

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BRIEFS

US West, Inc. recently announced that it has chosen Phoenix as the headquarters for the company's new Home and Personal Services market unit, which will provide "home and personal communications services" to more than eight million customers in 14 states.

The selection was announced by Jerry Johnson, vice-president and general manager of the unit, who noted continued population growth in the Southwest as one of the primary reasons for choosing Phoenix.

The Home and Personal Services Unit will develop and market products and services for residential customers. According to a US West spokesman, the headquarters will initially house about 150 management, technical and clerical employees. The company expects to add an additional 200 to 300 research people over the next five years.

The headquarters staff will oversee about 7,000 US West employees throughout the company's 14-state operating area. Most of the 7,000 employees — including salespeople, service representatives and installation, repair and collection personnel — work in existing sales and service organizations in Mountain Bell, Northwestern Bell and Pacific Bell Northwest offices, a spokesman said.

Corvus Systems, Inc. recently announced financial results for the fiscal year and quarter that ended May 31.

For fiscal 1987, Corvus reported a net loss of \$19.78 million, or 67 cents per share, on revenue of \$36.05 million, a 14% decrease from fiscal 1986 revenue of \$42.13 million. The company had a net loss of \$32.42 million, or \$1.15 per share, for fiscal 1986.

For the fourth quarter, Corvus reported revenue of \$7.28 million, a decrease of 36% from revenue of \$11.42 million for the similar quarter in 1986. A net loss of \$10.54 million, or 36 cents per share, was reported for the quarter, compared to a loss of \$2.67 million, or nine cents per share, for the similar period last year.

A spokesman for the company said the financial results "reflect a very difficult year for the company. It was a time devoted to clearing up many of the issues that were restricting the

See Briefs page 10

PACKET-SWITCHING NETS

EDS unit, Telefonica team up

BY MARY LINEHAN

Staff Writer

DALLAS — Electronic Data Systems Corp. (EDS) announced that its EDS Communications Corp. subsidiary has signed an agreement with Spain's Telefonica national Post, Telephone and Telegraph administration to establish a joint venture company that will sell packet-switching networks.

The joint venture will develop, market, sell and install packet data networks for users in the public and private sectors on a worldwide basis. Telefonica manufactures the Tesys packet-switching system, which is at the heart of the agreement between the two companies, an EDS spokesman said.

The Tesys system currently supports more than 25,000 terminals on the Spanish public packet network and is capable of switching up to 3,000 packets of information per second. EDS uses Tesys in its worldwide network.

"Spain is rapidly becoming an important force in the European information technology industry," according to Don Luis Solana,

executive chairman of Telefonica. "Telefonica's relationship with EDS raises our multinational profile. It also gives us an opportunity to secure business for the joint venture globally."

According to the EDS spokesman, the company expects that Telefonica's products combined with EDS' integration and management skills in data processing and communications will make the joint venture successful.

Telefonica has penetrated markets in Canada, South America and Central America — while EDS' market strongholds continue to be in the U.S., Europe and China.

"EDS is targeting multinational companies right now. We have had joint ventures in China, Korea and Italy, but this is the first time that EDS Communications has taken the lead position," the company spokesman said. He said EDS has been active in Spain for several years, including providing DP services for the Spanish railway system.

EDS Communications was established in 1986 as a systems integrator, designing, building and managing multinational communications networks. □

Briefs from page 9

company's ability to compete."

According to Corvus, the 1987 results include unusual, one-time operating expense items that totaled \$3.79 million, or 13 cents per share, and included anticipated lease-termination costs and the write-down of fixed assets.

Additionally, the company noted that profit was lowered by inventory write-downs. These adjustments totaled approximately \$5.4 million.

The 2026th Air Force Communications Systems Command recently selected Siemens Information Systems, Inc. to install basewide telecommunications systems at Travis Air Force Base in

California and Charleston Air Force Base in South Carolina.

The contracts, awarded under the Air Force Scope Exchange Program, have estimated values of \$17.5 million and \$7.6 million, respectively.

Both installations, scheduled for completion next September, will include Siemens KN S-4100 network switching systems. The KN S-1400 will serve 5,300 stations with 300 trunks at Travis and 3,100 stations with 138 trunks at Charleston.

The KN S-1400, a digital switching system, is the basis of the U.S. Armed Forces European Telephone System. The switching system includes centralized attendant service, centralized maintenance facilities and call-forwarding and

conferencing.

Siemens Information Systems, part of the Siemens USA Group of Companies, is headquartered in Boca Raton, Fla.

Citing personal reasons, the chairman of **British Telecommunications plc** announced that he will retire Sept. 30. Sir George Jefferson, who made his announcement at the company's annual shareholder's meeting Sept. 9 in Birmingham, England, denied that mounting public criticism of the phone company's service prompted his announcement — although he noted the need for improvements.

Jefferson, 66, will be succeeded by Iain Vallance, British Telecom's chief executive officer. □

Justice defers ruling on buyout

continued from page 9

cepted the decree's limitations as part and parcel of obtaining Southwestern Bell funding for their start-up venture," the filing said.

Southwestern Bell denied it planned to manufacture telecommunications gear through Tsunami. "Tsunami was never engaged in manufacturing nor did it, after our acquisition, even contemplate providing telecommunications equipment."

Marquart disagreed, saying, "Tsunami clearly intended to manufacture the equipment it was developing. That's what it was in business for."

Sunnyvale, Calif.-based Tsunami is developing a broadband local-area network that will switch voice communications, Tsunami President Robert Shatzer said last week. The technology could also be applicable in wide-area networks and RBHC local telephone networks, although Tsunami's immediate focus is on the local net market, Shatzer said.

Marquart said Southwestern Bell went to great lengths to keep the Tsunami acquisition secret — an effort that included changing the name of the company, which was called Orthogonal Systems, Inc. at the time of the acquisition. Orthogonal was founded by Marquart and three others in 1983.

Southwestern Bell said it kept the acquisition confidential for competitive reasons. "Knowledge of our investment in Tsunami would have given valuable insight and a competitive advantage to others regarding Tsunami's proprietary research," according to the Southwestern Bell filing.

Southwestern Bell did not seek the Justice Department's opinion on the legality of the acquisition under the Modified Final Judgment, nor did it seek a waiver from Judge Greene to engage in the manufacturing business.

Southwestern Bell announced in July that it would reduce financing of Tsunami and try to sell the firm. Southwestern Bell said its decision was based on sound business reasons and not the Justice Department investigation.

Marquart claims Southwestern Bell is trying to dismantle the firm "to minimize the impact of the DOJ investigation, regardless of the cost to the other shareholders."

Shatzer said Southwestern Bell had reduced financing for Tsunami, which has forced it to lay off 40% of its work force but denied this had affected the primary operations of the company. "We have 24 employees, and we are still in business. Southwestern Bell continues to provide interim financing and is actively looking for new investors. Southwestern Bell is not trying to dismantle the company," Shatzer said.

First Pacific Corp. of Hong Kong is reportedly negotiating with Southwestern Bell for acquisition of Tsunami. First Pacific is a holding company with interests in several U.S. financial companies. □

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“AT&T will nickel and dime you to death with its nonrecurring [Software-Defined Network service] charges. We look at these charges as admission to the club because you don't get any software or hardware. AT&T says the money is spent building the customer data base. But there is nothing we can point to and say, 'There is where the money went.'”

A telecommunications manager who requested anonymity

PRIVATE NETS

Wall Street firm goes fiber

Bear, Stearns signs with Teleport for T-1, T-3 data net.

BY MARY LINEHAN

Staff Writer

NEW YORK — Bear, Stearns and Co., Inc., a rising star on Wall Street known for its innovative use of information systems, recently signed a two-year contract with Teleport Communications to link its metropolitan New York offices with T-1 and T-3 fiber-optic facilities.

Under the terms of the contract, Teleport Communications will provide more than 200M bit/sec of aggregate transmission capacity to

link seven of the financial services company's offices with its newest data center in Whippany, N.J.

Although 90% of the network capacity will initially be used for data transmission, over time the network will play an increasingly important role in meeting the company's voice network needs.

“On average, there are a minimum of four T-1 links between buildings and some DS3 [45M bit/sec] facilities operating between New Jersey and New York,” said Bill Schade, associate director of communications at Bear, Stearns.

Schade said the New Jersey data center serves as the network hub, which supports points here in both lower and mid-town Manhattan.

Ken Starkey, a vice-president of communications at Bear, Stearns, said the new network consolidates other network facilities the company operated within the city into more “economical digital pipes that also tie in our new data center in New Jersey.” The predominant service displaced was 56K bit/sec digital data services from New York Telephone Co.

According to Jeff Marshall, an-

other vice-president of communications at Bear, Stearns, the new network is “viewed as a strategic and competitive tool that will give us additional flexibility, higher transmission speeds and cost savings.”

The new facilities will enable the company to support the higher speeds needed to remain efficient and to modify the network to meet changing needs, Marshall said.

The decision to go with Teleport was “strictly an economic one,” Schade said. “We knew we wanted to go with a fiber-type network and approached AT&T for rates for the new site in New Jersey. The rates we got back were rather high, and we were led to Teleport.”

Schade said Bear, Stearns was further encouraged to use Teleport services after learning AT&T used the net for some of its own links.

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CROSS TALK BOB WALLACE

Virtual network billing woes

Late, incomplete, incorrect or difficult to understand carrier service bills can mean administrative nightmares for communications managers whose duty it is to bill back end users in different departments, divisions or sister companies.

Billing problems have been drawing national attention recently due to the problems of AT&T's long-haul competitors. US Sprint Communications Co., for example, has acknowledged major difficulties integrating the billing systems of GTE Sprint Communications Co. and United Telecommunications, Inc., the two companies that merged to form US Sprint.

A universal problem

But all three of the major carriers, US Sprint, MCI Communications Corp. and AT&T, are experiencing billing problems of a different nature: getting bills straight for virtual network services.

The longer it takes to receive, validate or invalidate and translate a bill, the less time there is to determine which corporate department owes what for a given billing period. This process bogs down when the communications manager has to spend extra time or assign extra staffers to sort out the bill. Service bills that require extra attention detract from other duties.

John Lamore, voice communications manager for Transamerica Information Services, the subsidiary of Transamerica Corp. that provides communications services to the company's end users and bills them for those services, said accuracy and completeness of billing is a top concern with AT&T's Software-Defined Network (SDN) service.

“We are working with AT&T to assure the completeness of the SDN billing data,” he explained. “They want to get this prob-

lem resolved as much as we do.”

Billing service an issue

Susan Mersereau, telecommunications services division director for Weyerhaeuser Information Systems, the subsidiary company that bills Weyerhaeuser Corp.'s end users for calling services, said the company has encountered billing blunders with AT&T's SDN and US Sprint's Virtual Private Network services.

“Service billing issues have become a top priority for us in the last four or five months,” Mersereau said. “We are working with both vendors to define exactly what information we need for billing purposes and how they can provide us with this information.”

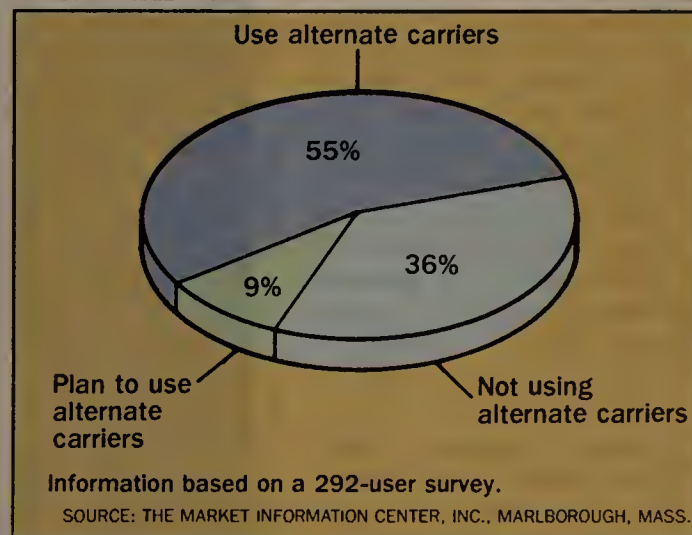
One virtual net user, who requested anonymity, spoke of difficulty determining the accuracy of its monthly service bills from AT&T. “There has never been a problem handling a billing discrepancy once we have identified it,” the telecommunications manager said.

The problem is isolating the errors. The company has received many incomplete virtual net service bills, which “creates a major problem for us because this keeps us from tracking how calls are routed.” The telecommunications manager said, “The vendor has issued many credits and has taken corrective action to address the problems when they arise.”

The carriers are working to eliminate billing problems with virtual network services by enlisting the aid of their customers.

In the meantime, customers considering subscribing to virtual net services may find it useful to discuss this critical issue with the carriers, current virtual net users and companies that help users process bills. □

Use of alternate long-distance communications carriers



PRIVATE VS. VIRTUAL NETS

Evaluating virtual nets

BY BOB WALLACE
Senior Editor

TACOMA, Wash. — Although carriers are trying to encourage customers to migrate from dedicated networks to virtual network services, many users are reluctant to give up the control private networks offer. Witness Weyerhaeuser Information Systems (WIS).

WIS, a subsidiary of Weyerhaeuser Co., uses virtual network services from AT&T and US Sprint Communications Co. to augment its eight-node private-line network. The composite net provides voice services to 180 locations nationwide.

According to Susan Mersereau, telecommunications services division director for Weyerhaeuser, WIS resisted efforts by numerous carriers to replace its entire domestic voice net with a single virtual net service. “There was a

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TELECOM TIDBITS

British Telecom International, Inc. recently began laying the world's first transatlantic fiber-optic cable. The company called the TAT-8 plan "the most ambitious cable-laying project ever undertaken."

At the UK endpoint, the cable will be connected to British Telecom's digital network, which will carry international traffic to a London switching center. The company said the cable will transmit the equivalent of 40,000 simultaneous telephone calls across the Atlantic Ocean.

Scheduled for service in the summer of 1988, the cable will support both public and private circuits and will carry telephone, telex, facsimile, data and television signals.

Overseas telecommunications services provider **RCI Corp.** recently added 25 countries to the list of destinations covered by its international service. Previously, the company served only Canada and the UK. RCI, a regional carrier serving the northeast U.S. with headquarters in Rochester, N.Y., said its rates will be lower than those of AT&T. The countries added to the service list include Australia, France, Japan, Brazil, Singapore, Hong Kong, Taiwan and Saudi Arabia. RCI is a subsidiary of **Rochester Telephone Co.**, a large independent telephone company.

Harris Digital Telephone Systems, a division of **Harris Corp.**, released Version 3.0 of the software that runs Harris' 20-20 Integrated Network Switch. The company also announced the Call Progress Detection (CPD) unit, an add-on device for the 20-20 that provides "the equivalent of call-answer supervision." The 20-20 is a digital voice/data switch designed for use as a tandem switch in interexchange carrier networks or as a private branch exchange.

The purpose of the CPD unit is to determine whether or not calls are answered, so that billing is accurate. The device differentiates among human answer, ring back, busy tones and special information tones by utilizing band-pass filter signal-processing techniques. The unit is priced at \$3,500.

Version 3.0 of the 20-20 software provides several new features, including automatic busy-hour traffic reports, configurable in-

tercept routes, indication of number of calls queued to an operator and trunk group identification digits. The software costs \$2,000.

Harris also announced several hardware enhancements for the 20-20 line: a direct current-powered battery backup that allows the 20-20 to operate during

power outages and a 2M bit/sec digital trunk unit for direct connection to international telecommunications facilities.

Harris is located in Novato, Calif.

Ft. Lauderdale, Fla.-based **American Credit Card Telephone Co.** an-

nounced a calling card service that uses major credit cards, such as Visa, MasterCard, American Express and regional Bell holding company calling cards. Holders of such credit cards can use them to bill long-distance calls made from any push-button phone, according to the company.

The new service, which is being marketed under

the name Card*Tel, allows users to dial the company's 800 number and, when prompted, enter their credit card numbers on the keypad. Validation and connection are reportedly performed within seconds.

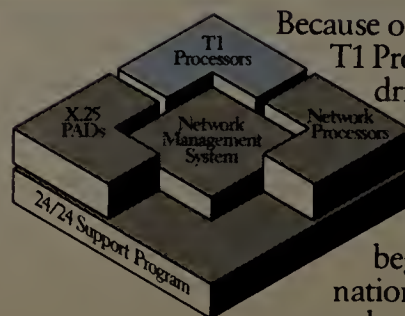
Initially, the service will be offered in Florida, Illinois and Washington, D.C.

VMX, Inc. recently announced that its VMX



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voice-messaging systems can be used with NEC America, Inc.'s NEAX 2400 UMG and MMG digital private branch exchanges.

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VMX voice-messaging systems already work with

Centrex service provided by an AT&T 1AESS or 5ESS central-office switch. The VMX system can also operate with the following PBXs: the Northern Telecom, Inc. SL-1, the Intecom, Inc. IBX family of switches, Rolm Corp.'s CBX II Models 8000 and 9000, the Siemens Information Systems, Inc.'s Saturn III, GTE Corp.'s 4600 and Omni, and Ericsson's MD-110. □

Wall St. firm goes fiber

continued from page 11

"After reviewing the alternatives, Bear Stearns settled on Teleport because the company's net provides fiber's known qualities of transmission and reliability," Marshall said.

Marshall declined to reveal specific terms of the contract.

Schade said the company "was hoping for reduced downtime due to the fact that there are redundant paths associated with the network, reduced error rates because of transmission integrity and increased data rates" because of the ability to allocate bandwidth better.

A Teleport spokeswoman said that, as a part of an agreement between the company and New Jersey Bell, Teleport is working to expand Bear Stearns' network even further through New Jersey Bell's fiber-optic network.

According to published reports, the firm has invested \$8.5 million in computer development over the last four years to quicken the pace of information accessibility in mortgage securities trading. □

Evaluating virtual nets

continued from page 11

very strong drive by several carriers to take over the entire private-line voice net, but we decided against that for several major reasons," she said.

"For one, we wanted to retain management control of our voice net. We had operated a voice net since 1963 and felt very strongly about the need to manage the network ourselves," Mersereau said. "We thought we could provide a higher level of network management in the current environment than if we turned the entire network over to one outside vendor." Mersereau said WIS has a very strong in-house support staff that has managed and maintained the net for almost 25 years.

WIS' decision to maintain a private network and use virtual net services fell in line with its long-term communications strategy, which, Mersereau said, calls for the integration of the firm's voice and data network. "We felt that if we turned over the voice net to an outside vendor, it would get in the way of our integration strategy," she said.

WIS opted to use multiple virtual network services because both were new in 1985, when the company decided to explore virtual networks. "We didn't know if virtual networking technology, as defined, would work for WIS," Mersereau said. "We took an experimental approach and decided to implement two, test them both and get experience from the use of each." □



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DATA DELIVERY/ NET MANAGEMENT

► INTERVIEW

IBM execs talk on NetView

Discuss possible changes, additions to net control system.

Sometimes accused of playing follow the leader in key areas, IBM has moved aggressively to fill the glaring need for an integrated network management system.

Analysts speculate that IBM will use NetView, its host-based network management system, to position itself as the most important vendor in a multivendor environment.

Recently, Network World Senior Editor Paul Korzeniowski visited IBM's Communication Products Division (CPD) in Research Triangle Park, N.C., and talked about NetView with three top IBM executives: Robert Bailey, product manager for network management products, Ralph Gleaton, manager of planning network management

products, and Jack Drescher, product manager for NetView/PC.

How important is network management to IBM?

Bailey: Network management is critical to our customers and, therefore, to IBM.

Gleaton: The network management group is the fastest growing group in the Communication Products Division programming laboratory. So, obviously, we feel network management is very important.

Does IBM plan to integrate more tightly the various independent packages that were rolled into NetView?

Gleaton: Integration means dif-

ferent things to different people, and we achieved a level of integration with the first release of NetView. For example, when moving from one component to a second, customers are now able to put a bookmark in place and toggle back and forth between the two components.

Our goal is more than simply taking the various components and tying them all together. Complete integration of various products involves broad issues. We have to be able to collect data and automate network management functions and eventually produce an expert system. Customers need that type of capability to manage their networks.

Customers won't be able to in-

“We don't plan to enter the telecommunications business. Reporters have written that since computers and telephones use the same technology, anyone in the computer business has to be in the communications business and vice versa. That sounds good but doesn't really make any sense. Some of our competitors have gotten in trouble trying to follow that strategy.”

Ken Olsen

President

Digital Equipment Corp.
Maynard, Mass.



Robert Bailey

stall networks with thousands of CPUs and expect operators to deal with individual CPUs. They will have to deal with all the CPUs as a system, and we are trying to achieve that level of integration. Our success will come if we enable customers to install networks of that size. They won't install them if they can't manage them.

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DATA DIALOGUE

PAUL KORZENIOWSKI

Vendors pry into open architecture

When the International Standards Organization's (ISO) Open Systems Interconnect (OSI) model was proposed 10 years ago, some industry pundits speculated it would level the networking playing field and force suppliers to turn out a variety of homogeneous products.

With more than 20,000 Systems Network Architecture networks in place, IBM was depicted as the company with the most to lose if OSI gained popularity. Analysts speculated the company would try to thwart OSI acceptance.

But one by one, vendors are falling into step, at least mouthing support for the model and, in many cases, actually supplying OSI products. Rather than fighting OSI, IBM has moved aggressively in this arena and was one of the first vendors to announce a set of products that conform to each of the seven layers of the network model.

To differentiate their wares, vendors are filling in missing pieces of the model with proprietary products. For example, network management is one area in which much OSI work has yet to be done, and IBM is trying to establish a de facto network management standard

with NetView, its host-based network management system. Directory services is another gray area, and Digital Equipment Corp. and Hewlett-Packard Co. have announced directory services products.

As a result, some interesting battles are taking shape. These vendors are trying to position their proprietary products so they may eventually be incorporated into the OSI model. IBM, DEC and HP said they would gladly open up their proprietary products so they can be incorporated into the OSI model. Their motives are more pragmatic than altruistic.

Vendors realize proprietary network architectures will have to offer some link to comparable OSI offerings. Suppliers will have two options: native support and gateway support. Native support means the link is actually integrated into proprietary products. Gateways layer software and sometimes hardware on top of proprietary products, and they are a less efficient approach because they add equipment and processing overhead to a customer's net.

Whenever a vendor's protocols are chosen as part of the OSI model, native support becomes a simple process because

the protocols have already been integrated into the company's products.

IBM has offered its LU 6.2 protocol to ISO as the standard for peer-to-peer processing. ISO's stamp of approval would benefit IBM in two ways. First, the company would save time and money. IBM would have to develop only one set of products, rather than two, to support both SNA and OSI protocols. Second, since other vendors already have comparable products, they would be forced to implement gateways. That explains why competitors twice rallied to thwart LU 6.2's inclusion in the model.

How much success IBM and its competitors will experience in incorporating their products into the model is unclear. Competition among various factions should increase in the coming months and may actually slow the standards-making process.

Two things are becoming clear. First, the OSI model will constantly be evolving. In fact, there is now talk of adding an eighth layer to the model. Second, users will always have networking choices because vendors will constantly try to differentiate their proprietary products from OSI standards. □

IBM INSIGHTS

Front ends moving off the back burner. Analysts report IBM is readying new front-end processors, including successors to the company's high-end 3725 front-end processor as well as its remote front-end processor, the 3720.

The new models reportedly will feature a flexible T-1 interface. Currently, only the IBM 3725 can support a T-1 line, and that support is available only by special request.

Along with the front ends, IBM is expected to release a new version of its Network Control Program (NCP), software that works in conjunction with IBM's VTAM telecommunications system and manages a Systems Network Architecture network. The new NCP software will transform a front-end processor into a PU 2.1 node so that it can participate in a peer-to-peer network with devices such as the IBM System/36.

The announcement will put more heat on competitors NCR Comten, Inc. and Amdahl Corp., which have not been faring very well in the front-end processor market of late. NCR recently shuffled its management team and withdrew its packet-switching and modem products. Amdahl was lagging well behind IBM and only recently announced a product that emulates the IBM 3725.

Ready for lift-off. As IBM strengthens the communications capabilities and the applications
See IBM insights page 16

IBM execs talk on NetView

continued from page 15

In order to automate many network management tasks, NetView customers have to program in Assembler code. Do you see a need to add a fourth-generation language to NetView?

Gleaton: Yes, we see a need for a higher level language in two areas. First, customers want to write in a procedural language that is easier to use than Assembler. Also, NetView has a command processor, Clist [a tool that enables customers to combine a number of commands into single command]. We see a need to make it easier to use as well.

We have to be careful in solving

these problems and designing something users can work with for a long time. A higher level language has to be able to interface to an expert system shell. Vendors have to be consistent in solving these two problems because it will not always be clear where you have to use expert system rules and where you use procedures.

Do you see a need to add graphics capabilities to NetView?

Bailey: The answer again is yes. Customers want tools that represent their networks graphically so they can monitor the status of their networks by looking at a dis-

play on either a workstation or a large screen. The key requirement is to keep the display up-to-date so they will learn immediately whenever something is amiss. The display should change color so a customer can zoom in on whatever is wrong.

Gleaton: We find every customer would like to have a graphic display of its network. Solving the problem of merely displaying network management data is straightforward. It is more difficult to design a tool that helps a customer manage its network. Right now, a product may query the network, send data back to the host and update a screen. We want the status information to flow automatically back as things happen. To solve

that problem, we have to understand what information a customer wants to display. As a first step, the customer may want to display which nodes are up or down. The more important issues are seeing how the network is performing, such as what percent of the network's resources are being used. Based on how things are performing, customers may be able to see problems emerge and take corrective action before they occur. Once vendors examine these requirements, they move toward implementing an expert system.

Why wasn't IBM's Network Performance Monitor bundled with NetView? Will NPM be incorporated into NetView in the future?

Bailey: NPM is a program offering developed in the Applications Systems Division and not here in Research Triangle Park. We are looking seriously at transferring NPM to CPD. I expect NPM to come under the NetView family of products. As far as bringing NPM's functions fully under NetView, we will talk with our customers and try to understand what their requirements are in that area.

Gleaton: Some customers don't seem to care if products are integrated or even if they're running in the same host. We can spend time to integrate products further or add new functions. Customers are now asking us for added functions.

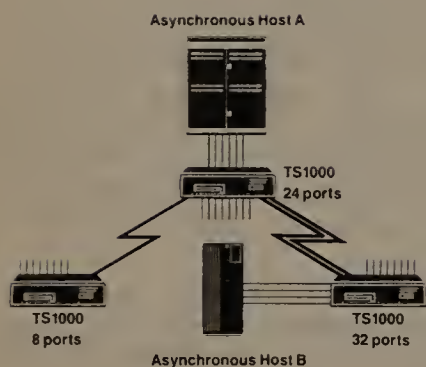
Why did you announce NetView/PC?

Bailey: In order to provide the capability for true end-to-end network management for Systems Network Architecture, a facility was required to deal with the non-SNA components on a network. NetView/PC provides the interface for those devices to the SNA network and thus to NetView.

Gleaton: Blatant pragmatism. We would like our customers to grow and buy IBM products. If management of the network is simpler, the market will expand. We realize that by opening up SNA further there may be cases in which a customer will choose another vendor's equipment, say terminals. There is a good chance it

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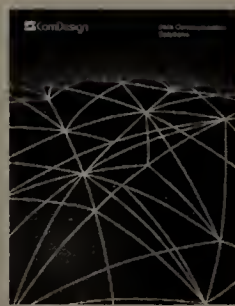
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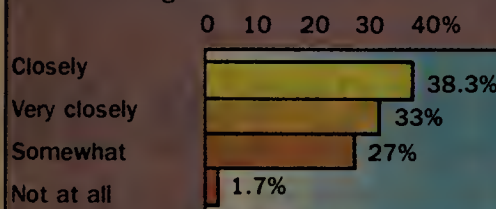
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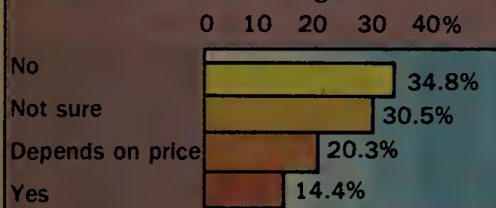
LOCAL NETWORKING

Local net users rate standards adherence and price discount influence on that adherence

How closely do you feel you will adhere to standards such as those established by the Institute of Electrical and Electronics Engineers?



Would lower pricing entice you to implement nonstandard configurations?



PERSONAL COMPUTING

Micro users on LAN hunt

PC managers are hot on the trail of connectivity know-how.

BY MARY PETROSKY

West Coast Correspondent

NEW YORK — With the explosive growth predicted for the local network market finally becoming a reality, more and more microcomputer managers are examining how local nets can be integrated into their end-user computing environments.

The growing number of microcomputer managers tackling networking issues led to nearly 160% growth in personal computer net shipments in 1986, according to International Data Corp. Senior Analyst Doug Gold. IDC is predict-

ing continued strong growth, 93%, in personal computer network shipments this year.

Because of the snowballing importance of local nets, end-user computing managers are flocking to connectivity seminars and stalking exhibit halls at personal computer-oriented trade shows for information on local nets.

For example, while many attendees at the recent PC Expo show here said they had yet to install local nets, they added that it is only a matter of time before they begin using them. Most were trying to learn as much as possible about the technology in preparation for

implementation. Learning about and planning for local networks is half the battle, they said.

"One theme I've heard a lot in sessions here is planning, planning, planning," said Howard Adamy, information systems manager for Emhart Glass Machinery Group in Elmira, N.Y. Adamy is currently evaluating whether to use a local network with a gateway or direct dial-up connections to tie personal computers in his division to a mainframe in the company's data center.

Adamy said a network would let users run such applications as elec-

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SECURITY

Bridge debuts secure local net product line

Systems control access to vital data.

BY PAULA MUSICH

Senior Editor

MOUNTAIN VIEW, Calif. — Bridge Communications, Inc. this week unveiled the first members of a new line of secure local network products that provide data encryption capabilities and allow users to control access to sensitive data.

The Secure CS/50 Communications Server and Secure NCS/AT Network Control Station — part of the Bridge Secure Network System — are designed to provide security in networks connecting corporate data processing systems.

Both the server and the network control station support the Department of Defense's Transmission Control Protocol/Internet Protocol suite over Ethernet, thin Ethernet or Bridge's 5M bit/sec broadband networking option.

The Secure CS/50 is an asynchronous terminal server that supports terminals, printers, modems or personal computers. The Secure NCS/AT is an IBM Personal Computer AT running Microsoft Corp.'s Xenix and network management software that provides centralized network monitoring and control.

Security features in the new products include user authentication, security profiles, access controls, two categories of data encryption and audit-trail information for monitoring and analyzing

access to sensitive data.

The two types of data encryption schemes include the Data Encryption Standard (DES) algorithm, certified by the National Bureau of Standards, and a public key encryption system. The DES algorithm is used to encrypt TCP sessions, while administrative and audit-trail information passing through the NCS/AT is encrypted using the public key system.

"We see an increasing awareness of security on the user side, especially with network administrators," said Joe Kennedy, vice-president of Bridge's Government Products Division, which developed the products for commercial markets. "When we introduced local networks in the early 1980s, we traded the flexibility of the LAN for the security of point-to-point links. Now, with the focus of networks shifting from departmental to corporatewide access, the potential for abuse of the network and the sensitivity of information in the network increase."

Other existing Bridge products will be enhanced with security features, and the product line will be targeted at banks, brokerage houses, law enforcement agencies and insurance companies. "Companies that maintain data bases on the public, such as credit or medical histories, and financial in-

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LANMARKS

ERIC KILLORIN

Making twisted-pair Ethernet a reality

Vendors of digital private branch exchanges have for many years proclaimed that telephone-type nonshielded twisted-pair wire is suitable for data transmission.

But with the technology that was available up to a few months ago, this wire type would not handle transmission speeds much beyond 2M bit/sec, relegating use of PBXs in a local networking capacity to low-speed terminal switching environments.

Although the wire hasn't changed, new line-conditioning equipment now enables telephone-type wire to support high-speed data, making this medium more suitable for true local network applications.

The demand for twisted-pair wire support has been driven by the high cost of running baseband coaxial cable. A new mandate was thus placed on firms entrenched in the Ethernet camp: Get around the cost burden of coaxial cable. Thin Ethernet coaxial cable has offered some relief, but the suc-

cess of IBM's Token-Ring — which runs on shielded or non-shielded twisted-pair wire — has caused all types of baseband coaxial cable to fall from favor.

The engineering challenge for vendors of Ethernet, which runs at 10M bit/sec, vs. IBM's 4M bit/sec Token-Ring Network, is to enable customers to use existing wire without adding substantially to the cost per connection.

Earlier this month, Digital Equipment Corp. and 3Com Corp. introduced a series of hardware options enabling non-shielded twisted-pair wire to support 10M bit/sec Ethernet. They followed SynOptics Communications, Inc.'s lead, in which the vendor introduced a similar capability earlier this summer. Hewlett-Packard Co. is also in the running but on a slightly different track: 10M bit/sec support for AT&T's popular Starlan, which is already a twisted-pair network.

The DEC and 3Com offerings result from a codevelopment effort between the two firms, but the two implementations have some differences.

3Com supports daisy-chaining over thin coaxial cable for

See page 19

Killorin is the publisher of "Netline," an industry newsletter on computer networks, and a publication of Hyatt Research Corp. in Andover, Mass.

► **ETHERNET**

Codenoll offers fiber interfaces

BY JIM BROWN
New Products Editor

YONKERS, N.Y. — Codenoll Technology Corp. recently announced a pair of fiber-optic interface boards for 3Com Corp.'s new MultiConnect Ethernet repeater, a device used to connect a cluster of workstations to an Ethernet backbone.

Codenoll's products plug into the MultiConnect unit, a 15-slot box that supports workstation connections using thin coaxial cable, thick coaxial cable and twisted-pair wire, as well as fiber-optic cable configured in either a passive or active star topology.

To interconnect MultiConnects, Codenoll introduced the Codenet-3311 Fiber-Optic Point-to-Point Module. It supports fiber connections between MultiConnects at distances up to 1.2 miles and is said to comply with IEEE 802.3 draft standards for fiber-optic interrepeater links.

On the workstation side of 3Com's MultiConnect, Codenoll offers the Codenet-3331 Fiber-Optic Star Connect Module. This device provides an interface to Codenoll's Codestar-LightBus passive fiber-optic local network coupler.

Used together, the Codenoll products enable each port of the 3Com MultiConnect to support up to 32 devices, including Codenet-3030A Ethernet transceivers and Codenet-3051 Fiber-Optic Ethernet personal computer adapter boards.

Codenoll also introduced its Codenet-3310 Fiber-Optic Ethernet transceiver. Used with the Codenet-3311 Fiber-Optic Repeater Module, the new transceiver enables a MultiConnect to act as an active hub in a

fiber-optic star network that connects Ethernet segments over distances of 2.5 miles. This configuration cuts in half the number of repeaters needed to inter-

connect Ethernet segments.

The Codenet-3311 Fiber-Optic Point-to-Point Module costs \$495. The Codenet-3331 Fiber-Optic Star Connect Module costs \$650. The new Codenet-3310 Fiber-Optic Ethernet transceiver costs \$595.

Codenoll Technology Corp. is located at 1086 North Broadway, Yonkers, N.Y. 10701, or call (914) 965-6300. □

Micro users on LAN hunt

continued from page 17

tronic mail and scheduling locally.

However, others at the show said they are still not entirely convinced of the need for local nets. Minolta Corp. has roughly 200 personal computers in its headquarters in Ramsey, N.J., according to William

Williams, manager of office automation and end-user computing. Although some users have asked for local networks, Williams has been unable to cost-justify the technology.

Approximately 45 micro-computer users are already tied to a mainframe via 3270-emulation products, and Williams wants to preserve this investment. In addition, he sees no real

The 802 WAN:

"WE USED TO TRANSFER MULTIPLE SITES VIA 'SNEAKERNET.'"



Bridge debuts line

continued from page 17

stitutions that have data they deem sensitive to public disclosure have the need to secure their networks," Kennedy said. "Even payroll information in a large company is very proprietary and requires that access be restricted."

The Secure CS/50 is priced at \$2,195, and the Secure NCS/AT costs \$17,900. Both are available now. □

need for the nets, maintaining that they cannot be justified on the basis of peripheral-sharing alone.

Session attendees at PC Expo, many of whom are responsible for personal computers, were told by speakers that efforts to network personal computers will inevitably involve MIS. And working with MIS can lead to conflicts.

"Connectivity is a very

political issue," said Leslie Fiering, who spoke at a session on local network bridges and gateways. Fiering, an assistant vice-president at Bankers Trust Co. in New York, outlined a number of gateway alternatives in her session.

She said MIS may want to limit local net users' access to a mainframe or refuse to support a gateway.

Using X.25 "lets you

communicate with just about anything, and it is a great way to go LAN-to-LAN," Fiering said. However, IBM's mechanism for converting from X.25 to Systems Network Architecture protocols is slow and takes two people from the data center to get it running, Fiering said. IBM achieves this through its Network Control Program Packet Switching Interface.

As a result, Fiering has been working with an outside vendor who is developing a way to convert from one protocol to another before the data stream reaches the cluster controller in front of the host. "The gateways I'm working with are just not mature. There's a lot of vaporware. But I think eventually we're going to have a rich number of choices." □

Making twisted pair

continued from page 17

subsequent connection to a single twisted-pair group; DEC uses dedicated twisted-pair connections to each node.

SynOptics has perhaps the most robust product set. Its LattisNet network uses stand-alone devices that mate a node's transceiver cable — coaxial cable — to the wiring in the wall — nonshielded twisted pair. A multiport concentrator located in the wiring closet acts as a hub, which can be linked via optical fiber.

Overcoming the technological hurdle of running high-speed data over nonshielded twisted pair is a milestone in the development of the local network industry.

Cable attenuation had to be overcome by the local network makers since this phenomenon restricts the maximum distance between a node and its respective wiring closet to 300 ft, on average.

Attenuation is the deterioration of a signal as it passes through the cable, and it generally increases, while the data signal decreases, with cable length. Attenuation is measured in terms of decibels.

AT&T's D-Inside Wire — standard 24-gauge telephone-type wire — has an attenuation level of 3 dB at 100 ft at 10 MHz, a level that has been found acceptable to support Ethernet.

Two other issues also had to be addressed: radio frequency emission and emanation. With the former, nonshielded cable acts like an antenna and radiates its signals into the local environment, thus corrupting adjacent transmissions such as radio, TV or mobile communications. The latter is the corruption of the Ethernet transmission from outside signals.

Emanation, for example, occurs when nearby fluorescent lights, radio signals or electrical motors emanate to a nonshielded local-area network cable and destroy the integrity of the data signal.

Like radio frequency emission, the local network cable is behaving like an antenna, but it is receiving instead of transmitting.

Circuitry available now accommodates the presence of signals that are nearby and allows the Ethernet signal to adjust for the imbalance.

Still, it is wise not to install nonshielded cable near potential trouble spots. □

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Head, Technical Support Services
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The Hughes Aircraft Company, the leading supplier of electronic systems for the nation's defense, is reaping the benefits of the 802 WAN™: a wide area network, based on the IEEE 802.3 standard, that transparently connects LANs over virtually any transmission media. Their 802 WAN now has more than 500 DECnet nodes, 500 TCP/IP nodes, and over 10,000 users "doing things they couldn't do before."

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COMMUNICATIONS MANAGER

EDUCATION

It's all academic for ICA's Phillip Evans

Users group VP helps managers make the grade.

BY MICHAEL FAHEY
Senior Writer

DALLAS — In a key role with the International Communications Association (ICA), Phillip Evans is working to meet the educational needs of both novices and veterans in communications management.

Evans, ICA's vice-president of administration, believes that, as communications technology becomes more complex and plays a growing strategic role in nearly every business, communications professionals require more rigorous training.

"With the technology and the applications changing so rapidly, it's important to have well-trained people coming into the

profession," said Evans, who is also director of telecommunications at FMC Corp., a conglomerate based here. "It is also important for those who are already in the field to stay current."

Each summer, Evans and Gus Bender, a vice-president of telecommunications for Hartford, Conn.-based Travelers Insurance Corp., run a week-long, ICA-sponsored educational program at the University of Colorado in Boulder. There, university faculty members, vendors and users share their knowledge of specialized communications topics. This summer, the program focused on T-1 transmission and multiplexing. Participants were able to get

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GUIDELINES

MICHAEL FAHEY

ICA report charts shifting management currents

Anyone who needs proof that profound changes have taken place of late in the communications profession need only look at a study recently released by the International Communications Association ("ICA reports on key trends," NW, Aug. 31).

Consider some of the key findings of the ICA's "1987 Telecommunications Professional Profile Survey":

- A major shift has occurred in telecommunications departments' reporting relationship in user organizations. In 1984, 50% of the telecommunications departments reported to data processing or management information systems. By 1986, that number increased to nearly 70%, as responsibility for telecommunications operations shifted away from corporate administrative or finance departments, the study said.

- Colleges and universities are playing an expanded role as training grounds for telecommunications professionals, as evidenced by the number of respondents who reported college as their primary source of telecommunications training.

In 1984, the number of telecommunications professionals who indicated college as their primary source of training was so small that it did not rate a separate category and was included with "other" types of training. In this most recent study, higher edu-

cation warranted its own reporting category.

The importance of college-level education was most notable in entry-level positions, where 13% of those surveyed listed college as their primary source of telecommunications training.

- According to the survey, which drew responses from 124 ICA member companies and provided information on more than 600 communications professionals, responsibility for international communications increased at all job levels.

That increased responsibility paid off for communications professionals. Salary levels were higher for employees involved in international as well as domestic telecommunications. Seventy-one percent of the participating companies reported having international communications operations.

The study grouped communications professionals into five levels, with titles ranging from vice-president or director to junior analyst or junior technician.

At the highest level, Level 1, those with responsibility for international communications received average salaries in 1986 of \$68,122 compared with an average of \$61,779 for their counterparts whose responsibilities covered only domestic communications.

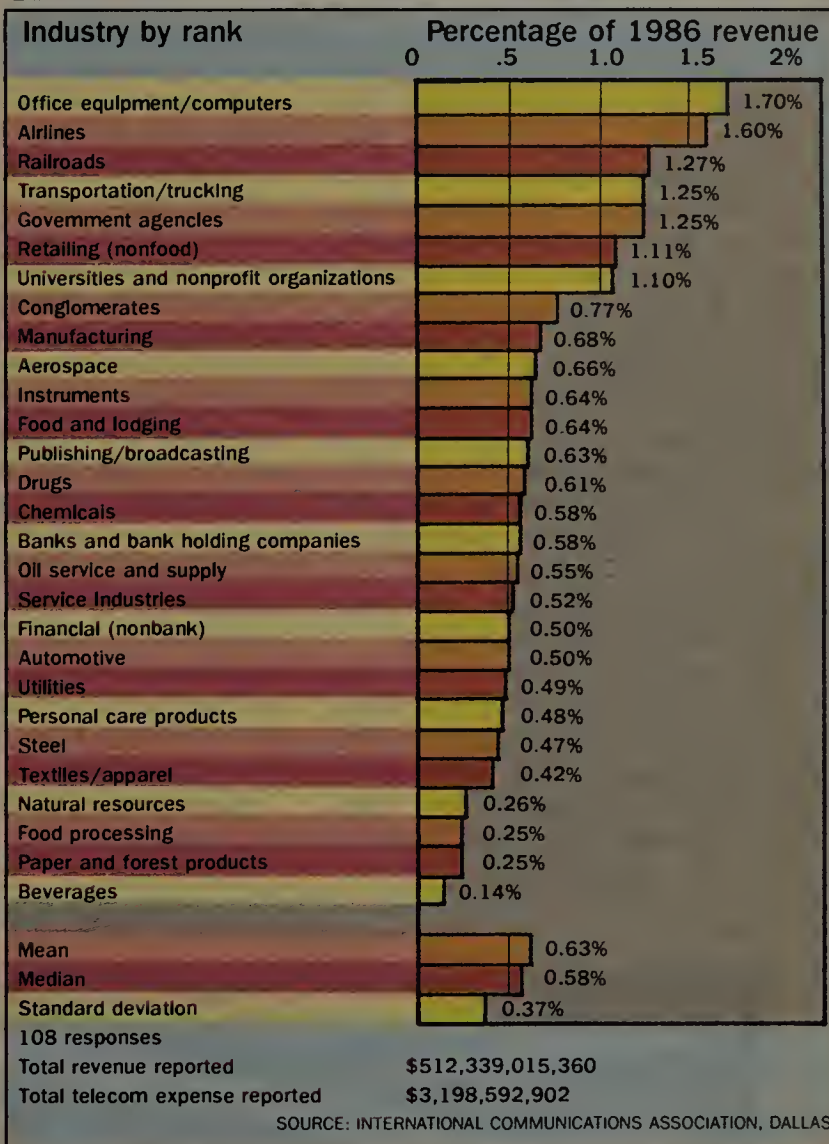
- The average salary increase from

See page 22

Incentive programs

According to the International Communications Association's "1987 Telecommunications Professional Profile Survey" one-third of ICA member companies offer stock and cash incentive programs to their telecommunications employees.

Telecommunications expense as a percent of total revenue



ASSOCIATIONS

The Ad Hoc Telecommunications Users Committee is worried that AT&T's opposition to regional Bell holding company involvement with Martin Marietta Corp. in providing Federal Telecommunications System (FTS) 2000 services could have negative consequences for private network users.

Earlier this year, AT&T filed a motion with U.S. District Court Judge Harold Greene objecting to the RBHCs' proposed role in the giant federal government network on the grounds that it would be a violation of the Modified Final Judgment.

The Modified Final Judgment prohibits the RBHCs from providing inter-local access and transport area switching services, which, according to AT&T, the RBHCs would handle if Martin Marietta won the FTS 2000 deal. Furthermore, AT&T contends that RBHC involvement in FTS 2000 could open the door to their providing inter-LATA switching service on a wider basis for private network users.

"AT&T's motion was phrased in a way that went well beyond FTS 2000," said James Blaszk, attorney for the Ad Hoc Committee. "It asked that the RBHCs not be allowed to provide switching services for FTS 2000. But it also asked the court to rule that the RBHCs not be allowed to provide switching services for other private networks."

"We believe that the RBHCs can tandem switch in connection with private networks provided that they do so in a ministerial capacity only," Blaszk said.

"This means that the RBHCs would not decide how traffic should be routed or to which interexchange carrier it should be routed," he said. "Instead, the carriers would implement carrier and routing decisions made by the end user." □

It's all academic for ICA's Evans

continued from page 21

hands-on training in the operation of multiplexers and other gear loaned by vendors, Evans said.

And, in addition to learning from the experts gathered for the program, users were able to learn from one another. "That is an important part of the program," he said. "Somehow it is easier to relate to another user. People would get up and share their knowledge and then sit through the rest of the program and learn themselves."

During the year, the ICA sponsors seminars, and its annual conference and exposition include scores of presentations and classes on a wide variety of subjects of interest to telecommunications professionals. "It isn't just the technology that people have to keep up with," Evans said. "Regulatory issues and tariffs are constantly changing."

Evans, who holds an MBA as well as an undergraduate degree in civil engineering from Texas A&M University, said he believes a knowledge of business and economics is also important for telecommunications professionals.

"We address the issue of making the business case and communicating with top management in our interim seminars, which are held in January," Evans said. "In addition, in all our programs, such as

the one on T-1, we address the economic and business side of selling the technology to management."

A former member of the ICA's board of directors and past chairman of the group's committee on academic development, Evans is also on the advisory boards of a number of colleges and universities.

According to Evans, the ICA aids university and college telecommunications programs by funding scholarships and bringing students and professors to the ICA conference to meet and learn from telecommunications professionals.

Since 1985, the ICA has allocated \$1.2 million to colleges, most of which will go to scholarships and program development, and the group has \$415,000 in academic development funds budgeted for distribution in 1988. In addition, the group encourages companies to donate equipment and services to universities. In August, Racal-Milgo, Inc. donated more than \$100,000 worth of network control equipment to the University of Colorado through arrangements negotiated by the ICA. The ICA also arranges for students to serve as interns at ICA member companies, Evans said.

According to Evans, who said he is impressed by the new breed of

telecommunications professionals graduating from college communications programs, this is also a benefit to the user companies.

"I think the level of telecommunications personnel is much higher than in the past," Evans said. "Telecommunications used to be relegated to the office services group because they had the PBX operators and there was only one contact needed, the local Bell telephone company. Now the quality of person required in telecommunications is much higher because the complexity is greater."

According to Evans, the rise of college telecommunications programs and the increasing opportunities for talented communications professionals is encouraging women and minorities to enter the field. "This is a profession in which an intelligent woman can have the opportunity to successfully compete with men," Evans said.

Evans himself has a solid background in communications. Before he went to work in the private sector, he spent nearly six years with Southwestern Bell Telephone Co. working in the engineering department and performing economic studies. He later worked in marketing for the carrier before leaving in 1968. Now in his 19th year working on the user side of the industry, he oversees a staff of 22 that operates and maintains a nationwide T-1 network for FMC. □

ICA report charts shifting currents

continued from page 21

1985 to 1986 for all communications professionals surveyed was 7.4%. The average increase for workers in U.S. industry as a whole was between 4% and 5%.

■ Nearly 60% of the respondents holding Level 1 positions indicated that they divided their responsibilities equally between voice and data communications. Only 7% of the professionals reported that they had responsibility for only voice or data communications.

■ For respondents who held Level 1 jobs, salaries were dramatically higher for those with responsibility for both voice and data, according to the study. The average base salary for vice-presidents and directors of communications who had responsibility for voice only was \$51,275. Communications executives who had similar titles but spent at least one-quarter of their time overseeing data communications made an average of \$64,762.

■ Communications professionals working in the oil and gas industries had the highest salaries, with Level 1 executives making an average salary of \$73,509. The second best paying industry category for communications professionals was manufacturing, in which the average salary for directors and vice-presidents was \$67,818 in 1986. □

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NEW PRODUCTS AND SERVICES

See inside for:

- ▶ Harris adapter boards
- ▶ Arcnet wares from CCSI
- ▶ Pilkington's 4-channel mux

▶ VOICE MAIL

VoiceServer for low end released

Digital Sound system has 2 to 8 ports.

BY JIM BROWN

New Products Editor

SANTA BARBARA, Calif. — Digital Sound Corp. recently unveiled a low-end version of its Unix-based VoiceServer voice application processor.

The firm also released VoiceServer networking software that enables up to 40 remote VoiceServers to be linked via dial-up or leased lines.

Targeted primarily for voice-mail applications, the VoiceServer 1000 supports up to 1,000 voice mailboxes. It ranges in size from two to eight ports and is capable of storing between two and 110 hours of compressed digital voice messages. The product is targeted at firms with 50 or fewer employees.

As with the larger VoiceServer 2000, the new unit uses a proprietary algorithm to digitize and compress 64K bit/sec voice transmissions to either 16K bit/sec or 9.6K bit/sec before storing them to disk. By removing pauses in nor-

mal human speech before recording the message, the system is said to be able to compress speech to 12K bit/sec or 8K bit/sec.

In addition to voice-mail applications, the firm said users can configure the multitasking unit to support voice-response applica-

Targeted primarily for voice-mail applications, the VoiceServer 1000 supports up to 1,000 voice mailboxes. It ranges in size from two to eight ports and is capable of storing between two and 110 hours of compressed digital voice messages.

tions, text-to-speech synthesis and Unix-based call-accounting applications. According to the company, the new product can be integrated with most private branch exchanges via E&M tie lines.

With the new software, VoiceServer users at one location are

able to send digitized voice messages to VoiceServer users at remote locations via a modem and either dial-up or leased analog lines.

The new software will support immediate transmission of messages between VoiceServers. It can also be configured to send batches of messages at user-defined intervals during the day or at night during off-peak hours.

Users receiving a message are able to transmit a reply to that message without entering a return address. They are also able to add to a message and then forward the amended message to other users.

The networking software enables users to maintain up to 15 message distribution lists, which are used to broadcast messages to several users simultaneously. The software limits the number of distribution lists supported by the system to 185.

The products are sold through a network of distributors and value-added resellers. The suggested retail price for the networking software is \$5,600 per node. The suggested retail price for a two-port VoiceServer 1000 with two hours of storage is \$18,800, while the suggested price for an eight-port system with 14 hours of storage is \$45,800.

Digital Sound has headquarters at 2030 Alameda Padre Serra, Santa Barbara, Calif. 93103, or call (805) 569-0700. □

▶ EQUINOX SYSTEMS

Data PBX supports 19.2K bps

BY JIM BROWN

New Products Editor

MIAMI — Equinox Systems, Inc. recently announced new central processor boards for its DS-5 and DS-15 data switches that enable attached terminals to link to computer ports or other peripherals at speeds up to 19.2K bit/sec.

The firm also announced a T-1 interface board that enables remote DS-5 and DS-15 data switches to link to a central site via T-1 lines. In addition, the firm lowered the price of the new boards over the older boards by using large-scale integration manufacturing techniques that reduce the number of board components.

By upgrading the central microprocessor from an Intel Corp. 8088 to an Intel 80188, the firm doubled the speed of the DS-5's and DS-15's backplane bus from 12.5M bit/sec to 25M bit/sec. That upgrade enables either unit to support as many as 660 full-duplex connections at speeds of 19.2K bit/sec, an improvement over the previous top speed of 9.6K bit/sec.

The new T-1 Link Board occupies one card slot on the five-slot DS-5 or 15-slot DS-15. By supporting D4 framing, the T-1 Link Board can transmit up to 72 data channels at 19.2K bit/sec or 144 channels at 9.6K bit/sec.

Equinox's DS-5 and DS-15 data switches enable one terminal to switch connections between a variety of computer ports or other peripherals. Users are assigned to a class of service that defines the other devices they can access.

The data switches support a mix of 12- to 48-port line cards supporting RS-232 or RS-422 interfaces. The units also support synchronous and asynchronous traffic. Administrators configure the units with menu-driven software accessed through an ASCII terminal linked to the processor board via RS-232.

The cost of a DS-5 system consisting of the chassis and central processor boards has been reduced from \$5,400 to \$4,800. A similarly equipped DS-15 has been reduced in price from \$8,800 to \$7,700. A 24-port line board is priced at \$1,800, while the T-1 Link Board costs \$5,000.

Equinox Systems is located at 14260 S.W. 119th St., Miami, Fla. 33186, or call (305) 255-3500. □

▶ DATA ANALYSIS

Micro software checks Ethernets

BY JIM BROWN

New Products Editor

CAMBRIDGE, Mass. — FTP Software, Inc. recently announced software that enables IBM Personal Computers to be used to analyze data packets on Ethernet local networks.

The LANWatch package, which requires the microcomputer to have a graphics board and at least 256K bytes of random-access memory, is compatible with several Ethernet adapter boards, including Excelan, Inc.'s EXOS205 and EXOS205T, Micom-Interlan, Inc.'s NI5010 and NI5210, and 3Com Corp.'s 3C500 and 3C505.

Operating in display mode, the package captures mirror images of Ethernet data packets in a buffer capable of storing 254 packets and displays the information on screen. Users can configure the package to store data packets to disk once the buffer

becomes full.

Otherwise, the package will erase packets from memory in order to free up space to receive subsequent packets.

Information displayed includes who sent the packet, the packet destination, the packet size and the networking protocol — such as Transmission Control Protocol/Internet Protocol — used to send the packet.

When the package is operating in examine mode, users are able to view the contents of data packets stored in memory. Examine mode will display packet header fields in a special screen format. The actual packet data will be displayed in hexadecimal and ASCII format.

By using software filters, the package can be configured to capture only certain packets, such as those sent from a suspect device. It can also be configured to capture all packets but only display specific ones, to load other pack-

ets into memory from a disk or to save specified packets from memory to disk.

Because the package also tracks the number of Ethernet data packet collisions and error counts, LANWatch is helpful in determining which network-attached devices are sending faulty data packets. It is also helpful in testing newly developed network protocols and in tracking the number of packets any one device on the network is sending.

FTP plans to release versions compatible with National Semiconductor Corp., Proteon, Inc., Ungermann-Bass, Inc. and Western Digital Corp. Ethernet adapter boards. A LANWatch version for Proteon's ProNET-10 network is also being readied.

LANWatch is priced at \$1,200.

FTP Software, Inc. can be reached by writing to P.O. Box 150, Kendall Square Branch, Boston, Mass. 02142 or by calling (617) 868-4878. □

► NETWORK MONITORING SYSTEMS

NetExec 2000 debuts

Product to be displayed at TCA show.

BY MARY LINEHAN
Staff Writer

EL DORADO HILLS, Calif. — TelWatch, Inc. recently announced a network monitoring system that links to existing network control products and displays network alarms on a single screen.

NetExec 2000 will be shown at the Telecommunications Association show in San Diego next week.

According to the vendor, NetExec 2000's software and hardware complement other network management systems already in place. The system uses the output of the other systems to create its own view of the net.

"A customer may have up to 13 different vendors' equipment on its network. Our system can take information from those vendors' proprietary management systems — or, if there is no proprietary system, directly from the network device — and provide a single integrated view of the network," said Bryon Flatland, head of product planning at TelWatch.

NetExec 2000 also works with IBM's mainframe-resident NetView and provides NetView operators with information about the parameters for analog voice and data lines as well as T-1 facilities. It en-

ables NetView operators to access reports about equipment components in the network.

NetExec 2000 runs on Unix-based processors. It can be used with networks of nearly any size, said a spokeswoman for the vendor. She said the management system is already used on the "world's largest private network," which she declined to name.

NetExec 2000 tracks network activity for analysis of network status. It also identifies problems and presents the information on-screen to the network manager.

The manager must then issue commands to the appropriate system to rectify the problem.

The vendor said the system monitors transmission equipment and circuits for failures. It also centralizes the collection of failure alarms and assists in the analysis of network trouble. The system enables users to control costs through bill verification, user chargeback, budgeting and management reports.

NetExec 2000's base pricing is not yet available, but cost will depend upon configuration.

TelWatch is located at 1241 Hawks Flight Court, El Dorado Hills, Calif. 95630, or call (916) 355-8550. □

► MULTIPLEXERS

Racal-Milgo mux links terminals, controllers

SUNRISE, Fla. — Racal-Milgo, Inc. recently introduced a pair of multiplexers that enable a group of terminals to share a link to a remote IBM terminal controller.

The firm's new eight-port Omnimux 2500 and 32-port Omnimux 2600 support transmission over either coaxial or fiber-optic cable. Both units will allow terminals located on one building floor to share a single link to a terminal controller on another floor, thus eliminating individual links between each terminal and the controller.

The coaxial versions support transmission distances up to 5,000 ft, while the fiber-optic versions support distances up to 10,000 ft.

Both units are compatible with the firm's existing Omnimux 2100, Omnimux 2200 and Omnimux 2300 multiplexers, and they will support IBM- and plug-compatible 3270-, 3180- and 3170-type terminals.

The Omnimux 2500 provides a single eight-channel link, while the Omnimux 2600 can support up to four eight-channel

links. The units poll attached terminals in accordance with controller-resident software and support transmission speeds up to 2M byte/sec.

Placed at the controller, an Omnimux 2600 can be configured to communicate with up to four different eight-port Omnimux multiplexers in a star topology. The Omnimux 2600 can also be configured to communicate with a string of other Omnimuxes in a multidrop configuration. The Omnimux 2600 can link to multiple controllers.

Both units have LEDs for each channel that indicate the presence or absence of data. The 2600 features such options as dual power supply, dual logic and dual link control.

Pricing for the coaxial cable version of the Omnimux 2600 starts at \$2,530, and the fiber-optic version starts at \$2,860. Pricing for the coaxial cable version of the Omnimux 2500 begins at \$1,155, while the fiber-optic version starts at \$1,485.

Racal-Milgo is located at 1601 N. Harrison Pkwy., Sunrise, Fla. 33323, or call (305) 475-1601. □

First Look

Fujitsu unveils trellis-coded modem

Fujitsu America, Inc. released a trellis-coded modulation modem capable of speeds up to 19.2K bit/sec.

The two-port Fujitsu M1928L supports synchronous transmission over leased lines in point-to-point or multiport configurations.

An integral two-channel multiplexer enables the mo-

dem to emulate two 9.6K bit/sec modems. An optional six-channel multiplexer can be added to enable the modem to support eight channels, each of which can operate at speeds ranging from 2,400 bit/sec to 19.2K bit/sec.

The modem automatically adjusts its speed to match line conditions, and it features an adaptive equalizer. The unit also features LEDs that display interface status and LCDs that display local and remote modem configuration settings, diagnostics and operating conditions. Configuration options can be downline loaded and stored

in the remote unit's nonvolatile memory.

The modem's suggested retail price is \$4,495.

Fujitsu America, Inc., 3055 Orchard Drive, San Jose, Calif. 95134, or call (800) 422-4878; in California, call (408) 434-0460.

Arcnet active hub, board introduced

Contemporary Control Systems, Inc. introduced an active hub for use in factory floor Arcnet local-area nets and a board enabling personal computers compatible with the proposed IEEE STD-bus standard to link to an Arcnet.

The 4012 Rack-Mounted Active Hub is designed to receive messages from one device and retransmit them to other attached devices. It supports up to 48 nodes in multiples of four. The hub enables links between devices attached to coaxial cable, fiber-optic cable and twisted-pair wire.

Configured as a master Arcnet node, the hub is able to communicate with up to 11 slave nodes. The device features an LED indicator that monitors network traffic.

The firm's S871P Arcnet Network Interface Module

enables STD-bus-compatible personal computers used on the factory floor, such as Pro-Log Corp.'s System 2, to link to an Arcnet.

The 4012 hub is priced at \$1,095, while the S871P board is priced at \$495.

Contemporary Control Systems, Inc., 2500 Wisconsin Ave., Downers Grove, Ill. 60515, or call (312) 963-7079.

Mux links four IBM controllers to host

Pilkington Communications Systems, Inc. introduced a fiber-optic multiplexer that links up to four IBM 3274 or 3174 terminal controllers to a host over distances of 10,000 ft.

The firm's 3128 time-division multiplexer also supports IBM's terminal controller-attached 3299 multiplexer. Used with IBM's 32-port 3274 controllers, the multiplexer enables up to 128 terminals to share one duplex fiber-optic cable to the host.

The price of the 3128 begins at \$2,650.

Pilkington Communications Systems, Inc., 65 Moreland Road, Simi Valley, Calif. 93065, or call (805) 522-3333.

Board links servers via Token-Ring Net

Harris Corp.'s Data Communications Division released an adapter board that enables its 9300 network servers to be linked via an IBM Token-Ring Network.

The IEEE 802.5-compatible Token-Ring Network Adapter fits into Harris' 9300, which acts as a file and print server in addition to providing links to up to four hosts for attached IBM Personal Computers, IBM 3270-type and ASCII terminals. Software provided with the board enables 9300s to communicate via a Token-Ring Network.

Personal computers and terminals will continue to link to the 9300 via Harris' HarrisNet 300 network operating system.

With the new product, messages between 9300s will be carried over a Token-Ring Network. However, the Harris 9300s will be unable to communicate with other Token-Ring-attached devices.

The Token-Ring Network Adapter costs \$1,295.

Harris Corp., Data Communications Division, 16001 Dallas Pkwy., Dallas, Texas 75248, or call (214) 386-2000. □

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Opinions

MANAGEMENT STRATEGIES

GEORGE MOSKOFF

What, me integrate?

All the ballyhoo over voice and data integration has never amounted to much. Some think it's because of the relative costs of the technologies. Others think it's due to the lack of capability in private branch exchanges to support high-speed data. But it's due far less to those issues than it is to a lack of cooperation and understanding between the corporate voice and data functions.

Voice and data are still stand-alone functions in most end-user organizations. Is a telecommunications-based solution to a data-handling problem better than others, such as using multiple terminals or lots of modems? The answer depends on one's perspective.

This is especially true at small and mid-sized organizations. In such establishments, MIS departments usually don't know about such things as using digital PBXs to support data communications at the desktop level or applications like modem pooling because they've never had to know.

On the other hand, the voice people usually don't know how MIS allows a single terminal to access many different hosts. It's not a switched application; it's a communications application using the host as a communications vehicle. But it works. And, in some cases, it doesn't cost very much.

So how should the integration problem be rectified? Clearly, when one party has knowledge that the other doesn't, and an ex-

Moskoff is president and founder of Telecom Resource Group Ltd., an independent telecommunications consulting firm in Geneva, Ill.

change of information would benefit the organization as a whole, the solution is education.

Of course, this will take some time, but managers can make time for all worthwhile projects. And if this one isn't undertaken soon, corporate communications strategy and equipment decisions won't be made by choice but by a lack of choices.

What are the real benefits of this communication on integration? Cost reduction, more efficient information flow and, most important of all, better competitive positioning for the company.

Philosophically speaking, the business race in the future won't necessarily be in producing better products or services but in improving the information flow associated with those products or services. The companies that move information the most efficiently and cost-effectively will be the winners.

However, achieving this goal requires solutions that integrate voice and data functions. Only organizations that integrate these functions will be able to capitalize on new solutions that utilize both technologies. For example, voice-messaging and call-processing — automated attendant — systems have emerged as new tools to provide better service and improve the flow of information.

But in many organizations, the acquisition of voice-messaging and automated attendant technologies is made without the involvement of the customer service or MIS departments. If MIS was consulted, it might be able to provide a better understanding of future applications for the system, such as the use

of a company's voice-messaging service to obtain access to information on mainframes using a simple push-button telephone.

Another example is the T-1 market. T-1 networks are being installed at a terrific pace, but who's buying all the multiplexers? Most of the time, it's the MIS or data communications group — not the voice people. If the multiplexer is going to be used for voice applications, the data group specifies the method of integration. And there's not often much discussion about it because the data communications group will say, "The voice people don't understand what we're trying to do."

These are typical scenarios that are likely to continue until someone in the company takes the lead and establishes a case for the integration of voice and data functions. That doesn't necessarily mean integrating them into the same department. But the two groups must have some common directions and goals.

Who should take the lead? Either party, as long as enough thought is given to the integration process. But to have a chance of succeeding, a solid business case must be made that includes some examples of current deficiencies and areas in which the company's users and customers aren't being well served.

Following this advice isn't political suicide. It is no longer a turf battle for data or voice superiority; it's now a race for market advantage in which the winners will be managers who can distinguish between their teammates and their true competitors and can work together toward common goals. **■**

TELECOMMUNICATIONS INDUSTRY

BRIAN JEFFERY

What's good for GM —

Major new players don't appear too often in the telecommunications business these days. It's interesting, then, to notice that Electronic Data Systems Corp. (EDS), a \$4.3 billion services firm owned by General Motors Corp., is indicating it wants to be one of the big players.

Signs that EDS is aiming at the telecommunications marketplace have been proliferating for some time now. Since it landed a \$350 million telecommunications integration job with GM, EDS has also taken a shot at the federal government's Federal Telecommunications System 2000 project — it initially teamed with US Sprint Communications Co. but later withdrew — and has been in-

Jeffery is managing director at International Technology Group, a Los Altos, Calif.-based research and consulting firm specializing in the IBM market.

involved in a number of major government and commercial telecommunications projects.

Even more interesting is that, late last year, the company folded its telecommunications systems integration joint venture with AT&T and formed its own telecommunications subsidiary, EDS Communications Corp.

Other straws in the wind have included an EDS ramp-up of a corporate accounts marketing plan (the new Multinational Marketing Group, formed in January), a slew of international joint ventures and acquisitions, last fall's expansion of the ERS*Net system as well as closer ties with fellow GM subsidiary and satellite communications specialist Hughes Electronics Corp.

The driving force in the whole process may ultimately be GM. The car maker's core auto businesses have not been doing well lately, and diversification into faster growing, technology-related busi-

nesses is obviously on the company's agenda.

The problem for GM, as far as EDS is concerned, has been the sheer volume of business it has been doing with GM — more than \$3.1 billion, or 73% of EDS's 1986 revenue. This has been good for EDS's operations, perhaps, but it hasn't actually earned anything for GM. Moreover, with an increasing proportion of EDS resources being soaked up in handling business with its parent, EDS began to look as if it was not going to represent the diversification potential for GM that lay behind the original acquisition.

This raises some intriguing questions. With its auto business appearing increasingly unattractive, is GM staking out telecommunications as a major expansion area? If it did, it would have some useful strengths. Apart from EDS and Hughes, GM has some formidable internal computer and telecom-

munications operations. It can also claim some expertise in what is quickly emerging as one of the key growth segments of the whole information-processing complex: large network systems integration.

GM has also focused on international telecommunications. The string of recent EDS expansions abroad with partners such as Ing. C. Olivetti & Co., S.p.A. in Italy and Nippon Telegraph & Telephone Corp. in Japan may be laying the groundwork for an international

What we don't need here is a failure to communicate. Write a column for our opinions pages, and let people know what you think. Manuscripts must be letter quality, double-spaced and approximately 600 to 750 words in length. Disk or modem submissions are preferred. Columns should be timely, controversial, literate and accurate.

Contact Steve Moore, features editor, *Network World*, Box 9171, 375 Cochituate Road, Framingham, Mass. 01701, or call (617) 879-0700, ext. 732.

Opinions

► TELETOONS — By Phil Frank

What do you mean.. "Hit and miss
Network Management Procedures"
I'm 10 for 10 today!



custom network infrastructure.

International networks are currently a wide-open market, in which the established U.S. telecommunications players such as AT&T, US Sprint and MCI Communications Corp. have no real presence. While EDS scarcely ranks as a major telecommunications player, it has nevertheless hit on a major growth opportunity in the telecommunications industry: The average Fortune 500 corporation is heavily diversified internationally.

In this time of unsettled world economic conditions and mounting international competition, coordinating international information systems is beginning to look like a high-priority item for many large U.S. user firms.

If GM is serious about expanding into technological businesses — and the kind of money it paid for EDS and Hughes suggests it is — might that mean further acquisitions? A common carrier would fit nicely, as would a medium-sized systems vendor.

GM's situation reeks of déjà vu. It used to be fashionable to speculate about big U.S. industrial corporations becoming players in in-

formation processing. Exxon Corp. tried it for a while, putting itself in a number of businesses that ranged from electronic typewriters to semiconductors, but the exercise didn't work out well for the company. More recently, General Electric Co. has gone on a conglomerate-style acquisition binge that has raised the possibility that it, too, might be looking in this direction.

Still, most of these were companies looking to get into the data processing business. Telecommunications may be different.

In the wake of the AT&T divestiture, many of America's largest industrial firms have moved to private networks. In doing so, they have accumulated some substantial in-house expertise and investments. GM, for example, ranked near the top among U.S. companies in terms of DP outlays and operations even before its acquisition of EDS.

Add to this an increasingly competitive and margin-pressured environment among telecommunications firms, and the combination of pressures and perceived opportunities could create some very interesting developments. ▢

TECHNICAL SUPPORT

JAMES CARLINI

Money talks or support walks

See here, you mugs! Whatever happened to the technical support the vendor mobs once had? There seems to be a prohibition on vendors hiring people who really know how products and services fit together.

It used to be you could use IBM and AT&T support teams as role models for other vendors to emulate. Now, it seems as though all vendors, including the big shots, are having a hard time supplying their customers with good technical answers and support.

With more user companies taking different directions with local-area networks, network management systems, network services and private branch exchanges, the need to have extra technical support at the user's location is critical.

In the good old days, users didn't have to worry about many details. They took for granted the free technical support that was provided to them as part of the deal when they bought products and services.

Now, there is a shortage of that type of support. Vendors are telling users, "Money talks or technical support walks," when confronted with requests for expertise. For cost containment, margin protection or other reasons, some vendor kingpins have decided to decrease the amount of support available. It's like adding water to the bathtub brew.

User projects depending on vendor technical support are likely to get the deep six if companies don't plan for this shortage of expertise. The lugs involved in managing these projects better wise up and buy some inside protection or bring in some out-of-town service providers. Otherwise, they might wind up sleeping with the fishes, compliments of the boss.

In companies where management is wise to the racket, they know the value of having some extra vendor-provided torpedoes around to help support a new network or communications system implementation. And if they don't get what they need from

the vendor side, they hire outside consultants.

Speaking of being up against the wall, the mob from Maynard, Mass. — Digital Equipment Corp. — can be proud of its tremendous growth in the last several years, but it had better start addressing the lack of technical support depth in some of its communications products lines.

Informants tell us that communications executives at several companies have expressed concern over DEC's support gang. It seems they're worried about the number of people DEC has hired in the last year or two who really don't know the product line very well. The executives are worried about post-sales support, especially the long-term support that will be available with such a big territory.

"Rack 'em up, boys!" will be what the competition says if DEC fails to meet the demands of this growing customer base. These user mugs will need more technical support, and DEC can't grow it overnight. The company is taking steps to beef up its technical people's expertise, but the classes and instruction can only go so fast.

Compared with some of the other vendors and network carriers, the MCI Communications Corp. mob is taking a different approach. Acting like good guys, it is expanding its technical support by hiring technical hit men to help customers with complex network needs. In contrast to some of the competition on the street, MCI has focused on helping the customer by expanding the technical support function that some end users felt was diminished, if not discontinued, by the notorious Ma Bell gangs after divestiture.

Will this support prohibition end, or have we seen the end of an era and the beginning of some new way of supporting users' technical needs? Will user companies bootleg more support people to make up the difference? Will consultants be in higher demand as hired guns?

Whatever the solution, someone is going to have to rob a bank to pay for the extra support users need these days. But compared with the expense of major systems failures, it'll be petty larceny. ▢

Carlini is president of Carlini & Associates, a management consulting firm in Westmont, Ill. He also lectures on information technology at Northwestern University in Evanston, Ill.

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multiplexes
voice and data
...big deal

Do you believe
they're
implementing it
in silicon?

Has he got his
venture capital
yet?

Their product
is still
in beta.




 NETWORK WORLD

Features

September 21, 1987

► *HIGH-TECH EPIC*

The T-1 Dynasty

*Personalities,
power and profits
propelled the first
start-ups into the
T-1 mux market.*

A family's vision, power, love and money are key themes in episodes of "Dynasty" and "Dallas." These elements also came into play during the emergence of three companies that have reshaped the way corporations build their communications networks: Network Equipment Technologies, Inc. (NET), Cohesive Networks, Inc. and Network Switching Systems, Inc. (NSS).

The saga began in the late 1970s as computer vendors searched for ways to help users lop off large chunks of their communications bills by bypassing AT&T's Bell System. These vendors concentrated on data communications and saw satellite communications as a

likely alternative to Ma Bell's services.

In 1978, Xerox Corp. and M/A-Com, Inc. teamed up on an ambitious project, dubbed Xerox Telecommunications Network (XTEN), which grew from the companies' petitioning of the Federal Communications Commission to open a new frequency band to support data communications. The companies planned to produce microwave cellular radios that would use the new band to transmit digital signals.

Meanwhile, the benefits of the emerging digital radio technology were also being recognized by Tymshare, Inc., a time-sharing company that was searching for ways to diversify its business. In the mid-1970s, Tymshare spun off its internal network into a sepa-

rate subsidiary, Tymnet, Inc., which ultimately nurtured the formation of NET, Cohesive Networks and NSS.

The first of many ironies surrounding Tymnet and its progeny occurred in 1978. Xerox hired William Combs, the first president of Tymnet, to head its XTEN project. Then, in the fall of 1980, Tymnet undertook its own digital radio project, code-named Cable and Radio Architecture for Value-Added Networks (CARAVAN), to determine the feasibility of using digital radio technology to build a nationwide backbone network. Under the aegis of technical visionary Art Caisse, Tymnet vice-president of business development, a small team of skilled technicians was assembled to build a backbone net-

Continued on next page

From page 29
work stretching from New York to San Francisco. Caisse plucked Tim Zerbic and Sarah Schlinger from other Tymnet divisions and recruited Roger Chrisman from M/A-Com and Lloyd Nirenberg from Stanford Telecommunications, Inc. for the project. Tymnet also teamed up with Satellite Business Systems, Inc., Viacom Cable Co., Manhattan Cable Co. and M/A-Com, which were to provide various pieces of the project.

For more than a year, Tymnet's CARAVAN project progressed slowly as the team uncovered shortcomings associated with the new technology. The team discovered that no vendor could supply network switching equipment so-

phisticated enough to support the network and that the market was too small for traditional suppliers like Rolm Corp. or Codex Corp. to produce such a device. Further, none of the business partners took

el. "From a switching standpoint, we set communications technology back 50 years," Chrisman notes.

The team overcame the limitations and deemed the project a technical success by 1981, when

abled the company to use the frequencies that Xerox had petitioned the FCC to make available.

As the project wound down through the summer and fall of 1981, Tymnet faced two business decisions. First, the company had to decide whether it should add circuit-switching services to its time-sharing and packet-switching businesses. Second, Caisse's group had designed a device to overcome network switching limitations. Tymnet had spent a lot of money since the mid-1970s developing a new network switch but hadn't decided whether to complete it. The device, code-named project ECCS, for Externally Controlled Circuit Switch, would be used for the company's internal network and would not be for sale.

Calls placed over the network were switched by an operator who pulled telephone jacks from a patch panel.

responsibility for the switching equipment. Calls placed over the network were actually switched by a telephone operator who pulled telephone jacks from a patch pan-

terminal-to-host and facsimile connections were established from San Francisco to New York. Also, Tymshare was granted a Digital Termination Service license, which en-

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Sept. 14	Sept. 2	Data General
Sept. 28	Sept. 16	IBM
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An IDG Communications Publication

The big guns bow out

In late 1981, citing a variety of reasons, Tymshare gave both projects thumbs down. One reason was corporate politics. Tymshare, not Tymnet, had developed all of the company's communications equipment, and turf battles erupted when Caisse's group proposed to build the new switch.

Also, the company placed more importance on the time-sharing as-

"From a switching standpoint, we set communications technology back 50 years," Chrisman notes.

pect of its business than on other opportunities. Caisse says the company was caught in the throes of the dying time-sharing business and didn't recognize that its internal network represented a more viable long-term business.

Schlinger, who did the project's business modeling, says the projects would have required a \$40 million investment with a payback period stretched out for at least seven years. However, Tymshare founder Ed O'Rourke was in the process of selling the company, and a capital-intensive start-up project wouldn't have sat well with potential purchasers. Meanwhile, Xerox also concluded that the new market wouldn't be lucrative and canceled its XTEN project after having pumped more than \$45 million into it.

Start-ups emerge

As the Tymnet CARAVAN project began slowly unraveling, Caisse and Chrisman examined new business ventures and were intrigued with starting a company to sell an ECCS-like network switch. The two kicked the idea around for six months before quit-

MacLean, whose husband worked at Rolm, insisted the company concentrate on the product's voice applications, since they represented the largest chunk of most companies' communications budgets. Caisse wouldn't budge on the design. Chrisman sided with MacLean, and the two split off from Caisse's venture to form NET. Schlinger soon joined the splinter group, as did another former Tymnet employee, Robbie Forkish, who was working at Bell Northern on enhancements to its private branch

Shortly after divestiture, AT&T announced Accunet 1.5 service, and large corporations began demanding T-1 multiplexers.

exchange.

Caisse replaced Chrisman and MacLean with a handful of other acquaintances, including still another Tymnet alumnus, Jim Ozimek, who had been working at AT&T since 1979. In September, Cohesive Networks was incorporated, and the company began scrounging for venture capital funding. Four months later, the company received its first round of capital, a \$1.5 million grant from venture firms Sutter Hill Ventures, Inc. and Bessemer Venture Partners, Inc.

Market sparked

Caisse thought the T-1 market would emerge slowly, with carriers such as MCI Communications Corp. and GTE Sprint Communications Corp. offering the T-1 service before AT&T. But shortly after divestiture, AT&T announced Accunet 1.5 service, and large corporations quickly began demanding T-1 multiplexers. The race to develop a device to support backbone T-1 networks was on.

At Tymnet during the same period, Alan Zucchini, vice-president of operations, began talking with

Zerbiec about forming their own company. Zucchini, based in Washington, D.C., convinced Zerbiec to migrate east so the two could share a house and formulate a business plan for what eventual-

The race to develop a device to support backbone T-1 networks was on.

ly became Network Switching Systems. Three start-ups had thrown their hats into the new market.

Meanwhile, MacLean, Chrisman and Schlinger were having trouble

getting financing. Caisse already had his foot in the door at the leading venture capital firms, many of which viewed the splinter group unfavorably. Since all of them had quit their jobs, money was becom-

ing a serious problem. "We stretched all of our savings and checking accounts to the limit," Schlinger says.

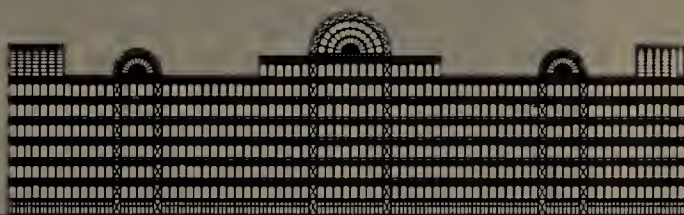
On April 1, which has become an

unofficial company holiday at Network Equipment Technologies, the trio lured Bruce Smith away from his position as president of the telecommunications manufacturing subsidiary of Communications Satellite Corp. Two months later, the group incorporated as NET after landing \$4.5 million in venture capital money from Merrill, Pickard, Anderson & Eyre; Oak Management; J.H. Whitney; and Hambrecht & Quist, Inc. "Bruce's presence gave us credibility in the venture community, so it became easier to raise venture funding," Chrisman notes.

Also on April Fools' Day, Zucchini's and Zerbic's plan took a turn for the worse. Zucchini was

Continued on next page

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Continued from previous page offered a new job at Tymnet and had to relocate to California. "We thought the added responsibilities would improve Al's resume and help us attract venture capital," Zerbic says. Zucchini packed up, Zerbic stayed behind, and their business plan was put on hold.

The push for product

With venture capital in hand, NET and Cohesive turned their attention to developing a new product. "In the engineering group, there was a joke that an employee who stayed 12 hours put in only half a day's work," Forkish says. Engineers such as NET's Forkish and Cohesive's Ozimek say they were too busy to worry about their chief competitor's progress.

Meanwhile, Zucchini and Zerbic recruited other Tymnet employees such as Harry Ruda, Howard Zidel and Carl Holmberg. In November 1983, the group left Tymnet, moved to Andover, Mass., and incorporated as NSS. In March, the company raised \$2.8 million in product development money. Many team members had sales and marketing backgrounds, so NSS recruited an engineering team. When Wang Laboratories, Inc. canceled a

"In engineering, there was a joke that an employee who stayed 12 hours put in only half a day's work," Forkish says.

project to design its own private branch exchange, NSS lured the bulk of the design team to the start-up company.

NET and Cohesive brought their products to market at about the same time. NET says its IDNX multiplexer was shipped to a beta site in September 1984 and that product shipments began in January. Cohesive says it shipped a beta version of its CN-1 multiplexer in November 1984 and that production shipments began in June 1985. Interestingly, both NET and Cohesive employees claim their company delivered the first switching T-1 multiplexer to market.

The design of the two products was similar, but the companies' marketing plans differed. Says NSS' Ruda, "NET went to market with a less sophisticated device initially. Customers didn't want sophisticated products, since they were still determining whether they should install a T-1 network. NET added sophisticated capabilities as customers demanded them."

NET also complemented its product with a direct sales and service organization, an expensive strategy that ate up much of the

company's \$25 million in venture capital.

Shakeout days

Rather than build its own sales organization, Cohesive searched

for a strategic partner to help market and support the CN-1. Ironically, one possible partner was Tymshare, which was ruled out before Cohesive signed an OEM agree-

ment, valued at \$40 million, with General DataComm, Inc. Tymshare lost out on another opportunity to garner revenue from the new market it had sparked.

In April, NSS also secured a stra-

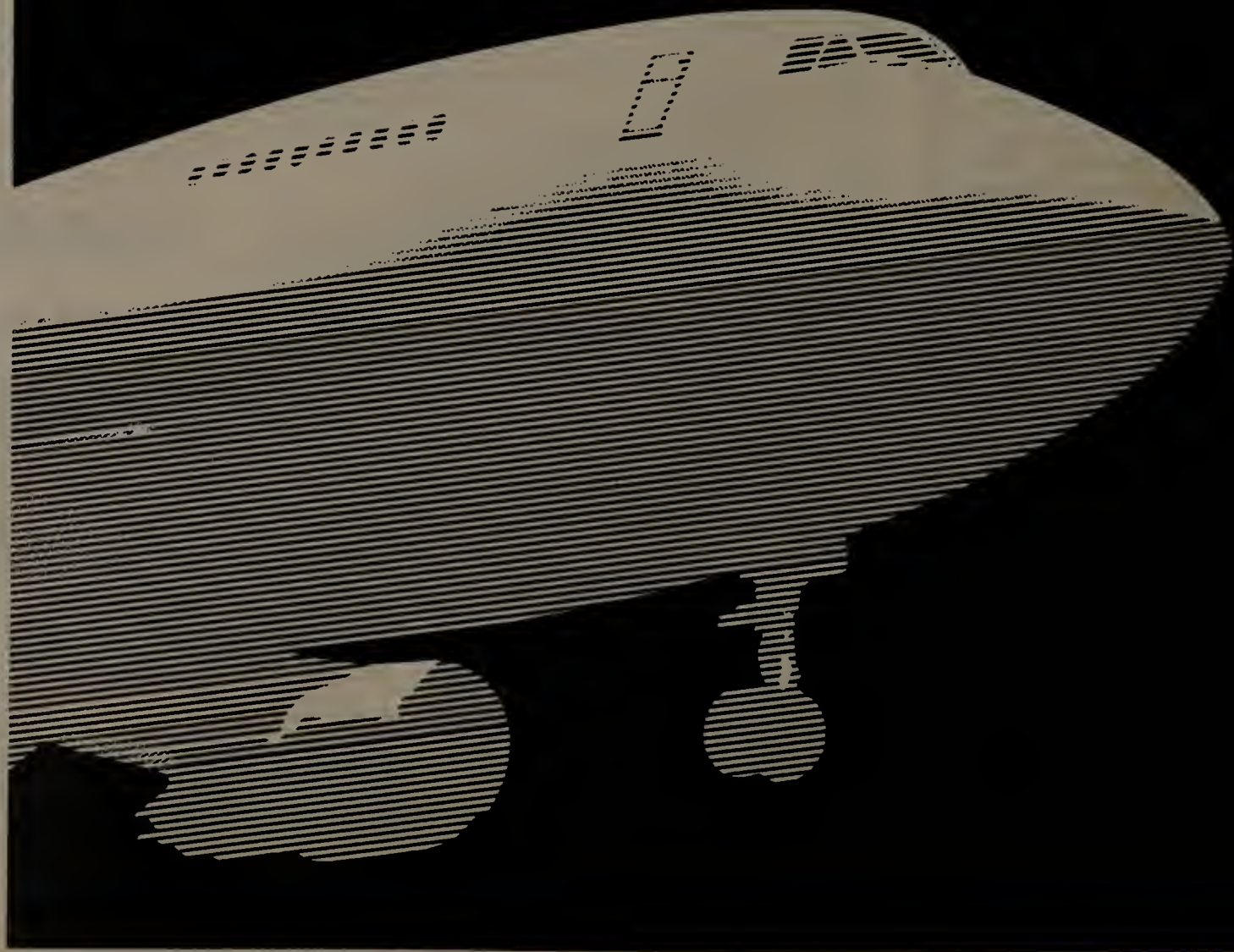
Both NET and Cohesive employees claim their company delivered the first switching T-1 mux to market.

tegic partner, Infotron Corp., which pumped \$3 million into the company during the second round of financing. From the outside, the company appeared to be function-

ing smoothly, but product design work was lagging. "We took a major hit in our product design schedule," Zucchini notes. The Wang group didn't comprehend differences in multiplexer and PBX design. Also, as NET and Cohesive shipped products, NSS tried to match both companies' product features. Consequently, the design of the NSS multiplexer was constantly changing.

In August 1985, the head of the NSS product development team was fired, a new manager was brought in, and production shipment dates, scheduled in nine months, were pushed back. In January 1986, Zerbic and two other Tymnet alumni, Rick Malone, who had been hired as Northern region

What our transportation clients will tell you about N.E.T.TM T1 networks:



sales manager, and Rosemary Cochran, who was manager of product marketing, left NSS to form a consulting firm. The parting was not pleasant, and eventually Malone filed suit against NSS, claiming the company lured him away from his previous job under false pretenses.

Meanwhile, an internal project at General DataComm to develop a high-end T-1 multiplexer caused Cohesive's OEM agreement with the company to die on the vine. In June, the first sign of consolidation in the T-1 multiplexer market surfaced as Digital Communications Associates, Inc. purchased Cohesive for approximately \$28 million.

NET's direct sales force added leading-edge customers such as

American Airlines, Inc. and Wells Fargo & Co. to its stable. In August, NET purchased ComDesign, Inc., which manufactures low-speed multiplexer equipment, and added Tymshare alumni Ken For-

netted Chrisman, MacLean, Schlinger and Robbie Forkish enough money to live comfortably, at least for the short term. The company's year-end revenue, reported in March, rose 450% to \$48

cations Corp. The company, finally, plans to release its product, named N16, in the fall of 1987. BBN and Malone settled their lawsuit out of court.

Epilogue

A few months ago, Caisse closed the book on his work at Cohesive and moved to realize another vision at his second start-up company, Data America, Inc., which is, ironically, located in Redwood City, Calif., the home of NET. Traces of bitterness from his first experience remain.

"This time, I'll be quiet about my plans and make sure that new employees sign noncompetitive agreements," he says.

Tymnet continues to develop its next generation switch after gaining no revenue from the explosive T-1 multiplexer market. "New ideas are always resisted by an established body," says Nirenberg, who now runs his own consulting firm, Competition Technology Corp. in Los Gatos, Calif. "Mini-computers didn't come from main-frame manufacturers. Instead, they came from a start-up company, DEC.

"The microcomputer didn't come from an established compa-

"This time, I'll make sure that new employees sign noncompetitive agreements," Caisse says.

kish, Robbie's brother, and William Putney, an independent consultant, to NET's work force. In January 1987, NET capped off its rise with a public stock offering that

million.

Meanwhile, NSS delivered a beta version of its multiplexer to Citicorp. In May, NSS was purchased for \$18 million by BBN Communi-

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"New ideas are always resisted by an established body," says Nirenberg, who now runs Competition Technology Corp.

ny. It came from a start-up, Apple. So, its not surprising that the T-1 switch didn't come from an established company," he says.

Ultimately, users may have benefited more than any of the individuals who worked on the the CARAVAN project. The project opened the eyes of a select group of engineers so they could see a future user networking requirement. "Other vendors would have eventually developed a switching product, but no one would have set out to do it in 1982," Nirenberg says. "Vendors would now be just bringing first-generation switching products to market."

The multiplexers gave users much-needed independence. As Zerbic concludes, "In 1982, customers feared the effects of divestiture. In 1985, they were hoping that AT&T Communications and AT&T Information Systems would be reunited.

"In 1986, they weren't worried any more. By using sophisticated T-1 multiplexers, users were able to build private networks that supplied them with more flexibility and management capabilities than they had previously," he says. □

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Service Focus: T-1 Services

Pipes of choice

Continued from page 1

sec and greater. These channels include T-1 channels (or DS1s, 1.544M bit/sec) and T-3 channels (or DS3s, 44.736M bit/sec), which are beginning to take an important place in the most successful networks in the U.S.

The major T-1 buyers fall into two categories. The first category includes carriers that use T-1 channels as high-capacity pipes to provide access into their own nets and to augment them. The second

Ellis is president of The Aries Group, Inc. in Rockville, Md., a consulting firm specializing in the design of large voice and data networks. He is also the author of two books and numerous articles on a variety of communications issues.

T-1s have become a major building block in large users' networks.

group includes users with large communications budgets, such as Fortune 500 companies and government entities that use T-1s as basic building blocks in their private networks.

T-1s began as the internal high-capacity digital channels used extensively since the 1960s to interconnect the end offices and toll offices of the public switched networks in the U.S. and Canada. In the mid-1970s, when the Bell System began selling private networks that were miniature versions of the public switched network, it was natural to consider offering end users the same high-capacity T-spans for private use once digital private branch exchanges appeared.

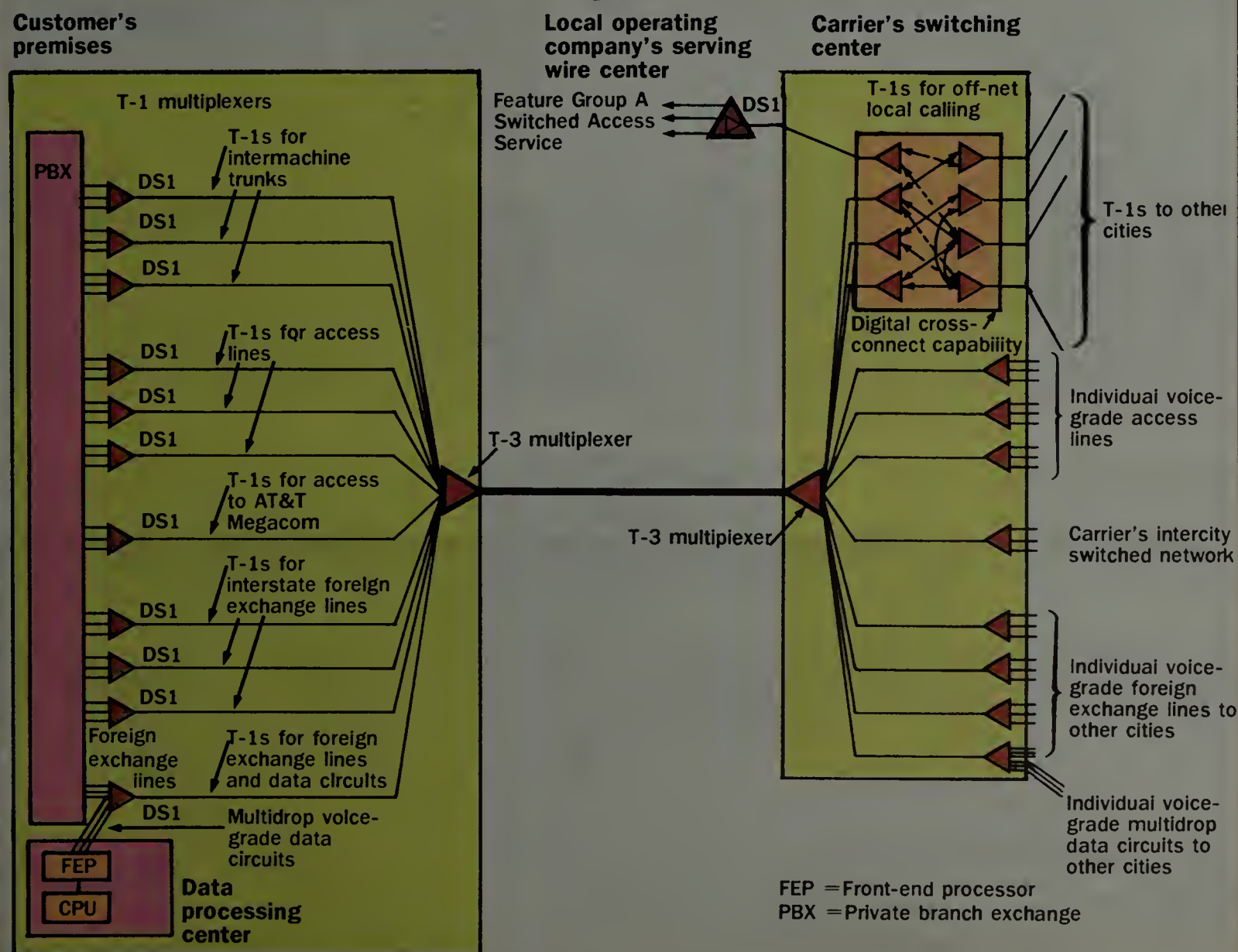
Until the final demise in June 1981 of Telpak, AT&T's bulk private-line offering, T-spans were a novelty item, referred to as "special assemblies" or "individual case-basis filings."

T-spans first appeared as T-1s in a tariffed offering in June 1982.

Continued on next page

Typical use of T-1 local channels

Figure 1



SOURCE: ARIES GROUP, INC., ROCKVILLE, MD

Continued from previous page
When T-1 service was first introduced, many people wondered how the service would ever sell. It seemed to raise the ante for a single channel used in a voice network from 3,000 Hz to 64K bit/sec, and it required an extensive and costly overhaul of PBXs and other equipment used in the network.

Divestiture has done much to address these early T-1 concerns. A divestiture surprise has been the remarkable success of T-1s among end users. Nearly all users with large telecommunications budgets have thought about using T-1s in their networks. Many hardware manufacturers are betting their businesses on a coming T-1 boom by developing digital PBXs, T-1 multiplexers and specialized equipment to help end users monitor and manage T-1 networks better.

However, much of the success of T-1s is their coverage in print, sem-

inars and conferences. T-1s are still very much a specialty item. In a recent tariff filing, AT&T itself estimated that it will lease only 2,345 intercity channel segments in 1988, as compared with nearly 400,000 voice grade channels.

The two T-1 markets

T-1 actually comprises two markets — one for long-haul or inter-local access and transport area services and one for local or intra-LATA services. In the long-haul market, about 15 firms are successfully competing against AT&T. US Sprint Communications Co., MCI Communications Corp. and Contel ASC in Rockville, Md., are three major competitors. Like AT&T, they offer T-1s under tariffs filed with the Federal Communications Commission.

Nearly all of the remaining firms have chosen, instead, to respond to the FCC's strong encour-

agement to offer their services on a nonregulated, nontariffed basis. Seven of these firms have pooled their resources to form the National Telecommunications Network (NTN), a predominantly fiber-optic-based network reaching most of the largest U.S. cities. The NTN firms compete successfully against AT&T on the basis of price, price flexibility, fiber availability and speed of installation.

Currently, most customers of the nontariffed service providers tend to be resellers and small long-distance companies. However, several of these companies are beginning to tap the end-user market. Some of the resellers are specialized T-1 resellers, such as Digital Signal, Inc., that acquire T-spans in large bundles under long-term contracts to benefit from discounts and then resell individual T-1s.

In the local and intra-LATA T-1 market, local operating companies

are the major players. However, many bypass vendors, such as Local Area Telecommunications, Inc., Manhattan Cable, Eastern Microwave, Inc. and Wang Communications, Inc., are successfully competing against the local operating companies in most major cities. Although price is an important issue, most bypass sales are made because of quicker installation intervals and a perception that bypass vendors are more flexible and responsive.

Successful bypass vendors price their services to match or to be slightly lower than fees charged by the local operating companies for local T-1 channels. The successes of bypass vendors have resulted in bitter complaints from the local operating companies and serious worries among local regulators about stranded investment and threats to universal service.

Continued on page 38

Interstate T-1 rates
Chart 1

Company	Tariffed service	Intercity mileage			Central office connection		Access coordination		Local channels	Fiber route option		Availability	Volume discount
		Contract term	Fixed	Per mile	Fixed	Per mile	Fixed	Per mile		Fixed	Per mile		
AT&T Communications, Inc. Basking Rldge, N.J. *	Rates effective Feb. 15, 1987	Month-to-month	\$2,600	\$15.50	\$62.00 per month	\$310 NRC	\$21.70 per month	\$207 NRC	Vary by state, local operating company and local access and transport area. Prices are fixed charge plus cost per mile. For zero-mile local channels, the range is \$227.06 for Washington Bell operating company to \$1,365.89 for Wyoming BOC. Rates for local channels reflect actual local operating company special-access charges plus 10.1% for AT&T overhead and \$4 per month for billing expenses.	\$100 per month	\$500 NRC	About 230 points of presence (POP) across the country. Fiber route option is available at nearly 60 POPs.	None
		Three years	\$2,600	\$14.85									
		Five years	\$2,600	\$14.25									
MCI Communications Corp. Washington, D.C.	Rates effective May 1, 1987	Month-to-month	\$2,565	\$13.50	\$62.00 per month	\$279 NRC	\$21.70 per month	\$180 NRC	Customer responsibility. Individual-case basis pricing if acquired and billed on customer's behalf by MCI. Rates will reflect actual local operating company special-access charges as of Feb. 6, 1987, plus possible surcharges to recover administrative expenses.	\$100 per month	\$400 NRC	About 54 POPs across the country. Fiber route option is available at 10 POPs.	Volume discounts are based on total monthly dollar volume of business, 3% at \$150,000 and 5% at \$300,000 on T-1 channels in excess of 400 miles.
		One year	\$2,565	\$13.30									
		Three years	\$2,565	\$12.90									
		Five years	\$2,565	\$12.40									
		\$67.50-per-month surcharge if T-1 channel is less than 200 miles.											
US Sprint Communications Co. Shawnee Mission, Kan.	Rates effective June 4, 1987	Month-to-month	\$2,500	\$13.50	N/C	N/C	N/C	Customer responsibility. Individual-case basis pricing if acquired and billed on customer's behalf by US Sprint. Rates will reflect actual local operating company special-access charges plus possible surcharges to recover administrative expenses.	N/C	N/C	About 110 POPs across the country. Fiber route option is available at nearly all POPs.	DS-1 Networking Solution offers discounts starting at 10 total T-1 channels. Actual discounted mileage rates vary based on the total number of customer T-1 channel segments and the average mileage of each T-1.	
		One year	\$2,200	\$13.00									
		Two years	\$2,200	\$12.60									
		Three years	\$2,200	\$12.25									
		Five years	\$2,200	\$11.75									

* AT&T has filed a tariff proposal that reduces the connection charges for the use of T-1 for Megacom and Software-Defined Network by about \$800 per month. The proposal was scheduled to go into effect on Sept. 16.

N/C = No explicit charge
NRC = Nonrecurring charge

SOURCE: ARIES GROUP, INC., ROCKVILLE, MO.

Interstate T-1 rates
Chart 2

Company	Untariffed service	Intercity mileage			Contract term discounts	Central office connection	Access coordination	Local channels	Fiber route option	Availability	Volume discounts	Note	
		Mileage band	Monthly rate										
			Fixed	Per mile									
LDX Net, Inc. (A National Telecommunications Network (NTN) member company), Chesterfield, Mo.	Rates in effect on Aug. 5, 1987. Negotiable in response to particular customer needs and requirements.	Quoted as an explicit price for each pair of cities. Nationally, rates range from 15% to 40% less than AT&T's rates and average about 20% to 25% less. Rates are set in response to market conditions for T-1 channels between each pair of cities.			Variable in response to market conditions, ranging from about 5% for one-year contracts to about 10% for five-year contracts.		N/C	N/C	Customer responsibility. Individual-case basis pricing if acquired and billed on customer's behalf by LDX Net. Rates reflect actual local operating company special-access charges — without any surcharge to recover administrative expenses.	N/C	About 50 to 60 points of presence primarily west of Chicago and New Orleans. LDX Net acquires from NTN partners to offer a national end-to-end service. Fiber is used on all but two routes.	Under consideration as a result of its acquisition of Williams Telecommunications Co.	
National Telecommunications Network (NTN), Rockville, Md.	Rates in effect on Aug. 5, 1987. Negotiable in response to particular customer needs and requirements.	One to 50	\$320	\$32.00	One year	3%	Bundled in with fixed charge, \$300 NRC.	N/C	Customer responsibility. Individual-case basis pricing if acquired and billed on customer's behalf by NTN. Rates reflect actual local operating company special-access charges plus a 10% surcharge to recover administrative expenses.	N/C	About 160 points of presence everywhere in the U.S., except for New England, Arizona and New Mexico. Fiber is used on all but two routes.	Volume discounts are based on total monthly dollar volume of business, 3% at \$150,000 and 5% at \$300,000 on T-1 channels in excess of 400 miles.	*
					Two years	6%							
		51 to 100	\$720	\$24.00	Three years	9%							
					Four years	12%							
		More than 100	\$1,870	\$12.50	Five years	15%							
					10 years	20%							

* Current prices are under review and may be quoted as specific prices between city pairs. Also, T-1s that are totally within the territory of one NTN member company are priced under that carrier's rates.

N/C = No explicit charge NRC = Nonrecurring charge

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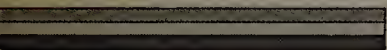
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Continued from page 36

The most common use of local T-1 channels is for access to a long-distance carrier's point of presence. Most of these local T-1s, whether acquired from the local operating company or bypass vendors, are used internally by long-distance companies.

In fact, AT&T might soon begin using bypass vendors for the local connections of its customers' long-haul T-1s. The mindset at many long-distance companies is that the better bypass vendors are able to deliver local T-1s of the same or better quality more quickly and at a lower cost.

Since the long-haul T-1 market is extremely price-competitive, few market players can afford to rule out the significant cost and delivery advantages that bypass vendors can offer.

A remarkable sign of the vigorous competition in the T-1 market was AT&T's tariff filing last October, in which it sought FCC approval to restructure its T-1 rates. The filing made constant reference to the activities of AT&T's competitors and specifically addressed the threat to its \$309.7 million-a-year T-1 business. The filing stated that AT&T forecasts the loss of up to \$57.1 million of existing or potential revenue from its Accunet T1.5 Service to competitors using fiber optics.

T-1s as "carrier bypass"

Before divestiture, the interests of AT&T and the local operating companies were the same. There was no incentive, either in cost or performance, for an end user to have direct T-1 access to AT&T's switching centers. After divestiture, AT&T became a customer of the local operating companies, so its switching centers — that is, AT&T points of presence, or central offices — became customer premises and therefore were not entitled to any special treatment. AT&T now has to pay local operating company access charges, levied under the federal and Public Utility Commission access tariffs, to provide local connections to its switching centers. In early 1985, once the structure of these access charges became clear, AT&T proposed three totally new services: Megacom, Megacom 800 and Software-Defined Network (SDN) services. These services put the burden of paying access charges on their customers.

The technical characteristics of these new services

and the economics of access charges strongly encouraged the use of T-spans to combine all of a customer's long-haul communications — whether private lines, foreign exchange, WATS or even data — onto high-capacity links to AT&T's switching center. The FCC was well aware of this use, which it terms "carrier bypass," when it prepared its review of the bypass issue

in December 1984.

The local operating companies objected vehemently to AT&T's Megacom and SDN protocols, but the protocols went into effect in November 1985. Megacom and SDN, as well as similar offerings by AT&T's major competitors, are currently important components of the largest networks operating today.

In the classic case, on-

site multiplexing equipment — or the software capability within a PBX — is used to combine the following onto a number of T-1s:

- Long-haul voice-grade channels used in private voice networks for access lines and intermachine trunks.

- Foreign exchange lines used to place local calls to a number of remote LATAs.

- Lines used to access a

carrier's off-net services such as WATS or Megacom.

At the carrier's point of presence, the T-1s are broken down into individual voice-grade channels for routing, and they may be packed into other T-1s for intercity transmission.

At the carrier's switching center, this packing and unpacking function is called M-24 multiplexing, where 24 voice-grade chan-

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nels are packed onto a single T-1. In many cases, a physical device such as a D4 channel bank does the multiplexing and demultiplexing, but many carriers now use software techniques instead. Digital cross connect services simplify the process of unpacking incoming T-1s and rerouting individual channels to be packed onto outgoing T-1s, as well as pro-

vide other services.

Other T-1 multiplexing techniques use statistical and error-correcting methods to deliver toll-quality voice at bandwidths less than 64K bit/sec; 32K bit/sec voice is common, and 16K bit/sec is not unknown. At 32K bit/sec, a single T-1 can carry 48 voice-grade channels; at 16K bit/sec, it can carry 96. One 32K bit/sec technique

seen in tariffed carrier offerings is M-44, a multiplexing service that combines two T-1s onto a single T-1 channel. This is also known as channel-expansion multiplexing.

Given the encoding scheme used in M-44, four subchannels cannot be used, so the resulting T-1 can carry only 44 voice-grade channels. Other T-1 multiplexing techniques of-

fer better utilization of the T-1.

Handling data circuits

Analog voice-grade data circuits can also be multiplexed onto these T-1s to the carrier's switching center. The easiest way to deal with these analog data circuits is to put each on one of the 24 subchannels of the T-1, an approach called voice-band data. Under this

approach, the entire 64K bit/sec subchannel will be used to carry a data channel that may be operating at only 2,400 bit/sec — a practice perceived by many as wasteful.

A surprising number of the T-1s used to connect the computer centers of AT&T's largest data customers to its points of presence use the voice-band data approach.

More complex approaches strive to make better use of the 64K bit/sec subchannel and require that the analog data circuits first be converted to digital, then multiplexed with other data circuits onto the 64K bit/sec segment. At the carrier's switching center, the process is reversed: The data circuits are demultiplexed and then converted back to analog. Digital circuits are much easier to accommodate and involve no conversion before multiplexing.

Though it's technically easy to merge voice and data circuits on the same T-1, there are good reasons to be wary of this practice. Often, data circuits are multipoint polled lines that are finely tuned to maximize their performance under a particular communications protocol. They carry a great deal of control and synchronization data between a main computer center and remote terminals. In routing these data circuits through devices that are tuned to serve the needs of voice communications, there's a risk that this control information may be lost or suffer time-outs, thereby impairing the performance of the data network.

In its work with integrated voice/data T-1s, The Aries Group, Inc. specifically recommends that its clients not use their voice switches to merge voice and data circuits but instead use a separate, fairly unintelligent T-1 multiplexer or an intelligent one specifically programmed to resist its urges to show brilliance. Again, this minimizes the risk that important control information for the data circuits will be lost or timed out by switching or queuing delays.

Aggressive T-1 multiplexing techniques such as M-44 are specifically adapted for voice and significantly reduce the bandwidth available for data transmission within a particular 64K bit/sec subchannel. Most Aries Group clients who are considering combining voice and data onto the same T-1 and who

Continued on page 41

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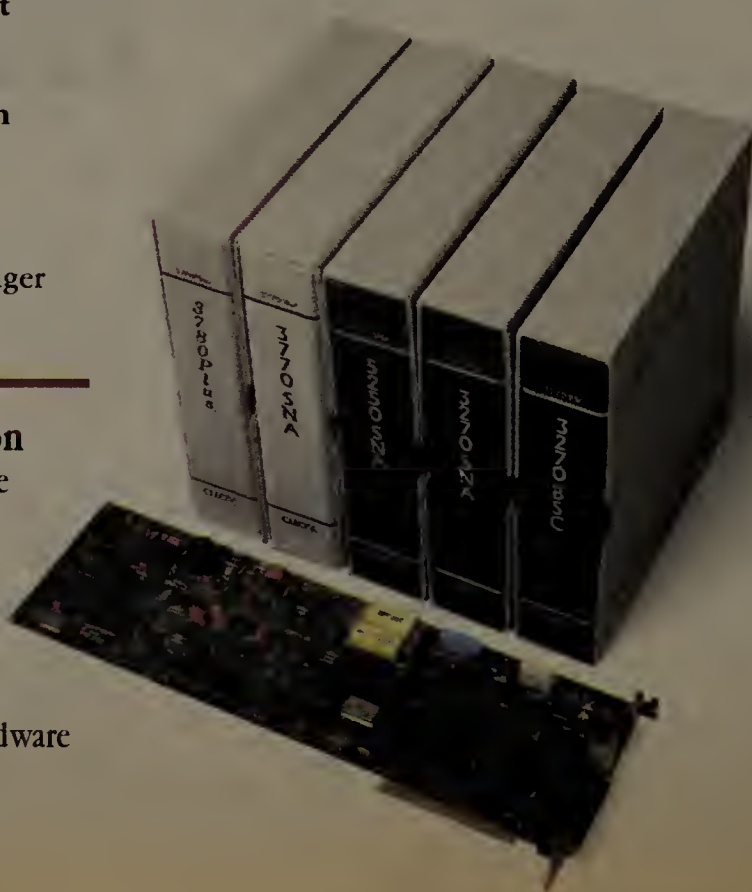
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Continued from page 39
are using 16K bit/sec or 32K bit/sec voice, avoid M-44 in favor of more advanced and more friendly T-1 multiplexing techniques, such as those in equipment marketed by Timeplex, Inc., General DataComm Industries, Inc. and Network Equipment Technologies Co.

The integration of voice and data communications in T-1 networks is done purely at the physical transport level, which is Layer 1 of the Open Systems Interconnect (OSI) reference model. Since the physical and operational characteristics of voice and data are dissimilar, few people are now considering an integration at the data link or network levels, or Levels 2 and 3 in the OSI reference model. For data people, voice conversations are an application as dense as a remote high-speed line printer.

Intercity T-1s

Among end users, nearly all intercity T-1s are used in private voice networks. Very few data networks are large enough to require an entire T-1 between data centers, regional processing sites or concentrator sites. Aggressive competition in the intercity T-1 market has done much to reverse some of the dramatic increases seen since 1980 in prices for the dedicated private-line connections that are used so heavily in private voice networks.

The demise of Telpak, the introduction of tapered WATS and the postdivestiture tariff shocks have been major, adverse changes threatening the economic underpinnings of every private network in the U.S. The competitive rates for T-1s as high-capacity bulk facilities have restored, to some degree, the low-cost private lines that are critical for the economic success of these private networks.

Competition forced AT&T to react in October 1986. Its proposed changes won FCC approval and went into effect on Feb. 15, 1987.

With these February changes, AT&T significantly increased its rates for short-distance T-1s and drastically reduced the rates for long-distance T-1s. AT&T's competitors were quick to respond to its changes and are now quoting their rates as "15% to 40% less than AT&T."

AT&T's nontariffed competitors are free to charge whatever rates they feel are appropriate and can re-

spond to market conditions. As noted in the rate summaries in the charts on page 36, the nontariffed carriers are now evolving toward a "city-pair" pricing system. Under this system, they quote their rates for T-1s not as a mileage algorithm like AT&T's but as a specific rate per T-1 between each pair of cities. In the mileage algorithm, rates are \$2,600 plus

\$15.50 per airline mile — no matter which two cities are being connected and what physical route must be followed.

Maximizing the advantage

With a specific rate per T-1 between cities, nontariffed carriers can maximize the local comparative advantage of their networks and limit their aggressive pricing to just those routes

where there is significant competition. As nontariffed carriers, they are also free to offer whatever discounts, incentives and special deals seem appropriate to clear local surpluses and extra capacity.

The nontariffed carriers have been quite successful, both in winning business and in installing new fiber networks. Most of these carriers sell to long-dis-

tance resellers and provide them with cost-effective high-capacity channels that enable resellers to survive and prosper against AT&T. However, the nontariffed carriers have also become credible players in the end-user T-1 market. The quality, price and quickness of their service has done much to spur changes in the way AT&T

Continued on next page

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NETWORK WORLD

An IDG Communications Publication

From previous page
and the other tariffed carriers do business.

AT&T and its largest competitors offer their T-1 services under tariff. If a carrier chooses to offer its services under tariff — all interstate long-distance carriers except AT&T have the option not to file a tariff — it must abide by the rates and terms of its tariff and cannot offer a binding off-tariff deal under any circumstances. A tariff exists to ensure that all customers of the tariffed service pay the same rates under the same terms for the same service.

These limitations make it extremely difficult for the tariffed T-1 players to compete on price. The tariff limitations are clear and explicit: No special deals for anyone. Any deal proposed by a tariffed carrier must appear in its tariff to be lawful and binding, either as a special promotion or as an individual case-basis filing. This term appears in tariffs as ICB, the tariff equivalent to the notation seen on restaurant menus for the price of lobster.

However, The Aries Group has heard from several clients that this tariff limitation hasn't kept some of AT&T's tariffed competitors from proposing off-tariff deals to compete against the nontariffed players. Readers are urged to beware of such off-tariff deals from a tariffed carrier because they are extremely dangerous.

Since a tariffed carrier must bill its rates under tariff, any other price is not binding or enforceable. In the case of a change of management, a complaint by another party to the FCC, an examination of a carrier's books by auditors or a bankruptcy trustee, or a change of heart by the carrier's marketing or billing people, an off-tariff deal will be washed out and the user will be liable for the difference between the tariffed rates and his rates retroactively for the entire period these off-tariffed rates were changed.

Also, under the Communications Act of 1934, the user can be required to pay three times the amount of his rebate to the federal government, a \$10,000 fine and spend up to one year in jail.

The tariffed players are facing a difficult challenge and may be forced to offer their T-1 services on a nontariffed basis. But few end users are complaining. The turmoil is a sign of intense competition in a new and fast-growing market.

T-3 services, anyone?

T-1s are not the only T-spans available. The access tariffs of the local operating companies also show T-1C (3.152M bit/sec), T-2 (6.312M bit/sec), T-3 (44.736M bit/sec) and T-4 (274.176M bit/sec) services. Their individual case-basis filings show many instances of entire fiber bundles installed for certain customers at speeds in excess of T-4. AT&T introduced T-3 service — Accunet T45 Service — over its fiber network on Feb. 17, 1986 and now serves almost 60 cities.

T-3s have the capacity of 28

T-1s and can cost-effectively replace five to 15 individually purchased T-1s. In the largest end-user networks, users are beginning to find T-3s a cost-effective way to carry local channels to a carrier's point of presence. T-3s used as intercity components of a private network are a rarity outside of state government networks. Few other networks have the necessary traffic volume, high-traffic density per LATA and narrow geographic extent required to make cost-effective use of intercity T-3s.

Other issues

All long-haul T-1 vendors, including AT&T, offer discounts for long-term contracts. Most long-haul vendors offer volume discounts if a customer's order for T-spans exceeds \$50,000 to \$150,000 per month. Volume discounts encourage customers to keep all of their T-1 business with a single carrier. At this time, only the bypass vendors offer discounts of any type for local T-1s. The access tariffs of the local operating companies have no provision for discounts based either on total dollar volume or length of contract.

No long-haul T-1 vendor, including AT&T, can offer an end-to-end connection over its own network facilities. The local channels on each end are an important component of the end-to-end connection. Since these local facilities are provided by others, no long-haul T-1 vendor offers volume or length-of-contract discounts on these local channels — unless it is using a bypass vendor that offers discounts.

A long-haul vendor's discounts apply completely to the facilities that it provides directly. AT&T resells the local channels provided by the local operating companies as T-1 local channels offered under the terms of FCC Tariff 11. Other long-haul vendors are willing to acquire the local facilities for a customer on an individual case-basis effort. AT&T and most other long-haul carriers add an administrative service fee on to the local operating company charges, a surcharge that can amount to 10%. However, one of the NTN fiber companies, LDX Net, Inc., says it passes these costs through without any extra charges.

AT&T and MCI also charge explicitly for miscellaneous items such as central office connections and access coordination. The other carriers bundle these miscellaneous charges in with the fixed portion of their long-haul mileage charges.

At the high end of the telecommunications market, the postdivestiture era is at its best — innovative products, diverse services, successful competitors and aggressive prices. But this vitality makes the T-1 market a riskier one for buyers.

Without a good knowledge of the products and players in the marketplace and without a good understanding of their capabilities and limitations, buyers could be disappointed. The traditional consumer advice is quite appropriate even now: Caveat emptor. □

► *PROFILE*

Treetop telecom

BY PAULA MUSICH
Senior Editor

The U.S. Forest Service is unique among federal agencies in its esprit de corps. This sense of family and the agency's prudent approach to managing the country's natural resources are what drew Steve Werner, telecommunications branch chief, to the service nine years ago.

"One of the most impressive things about the Forest Service is the degree of competence within

the organization. It's a dedicated group," Werner says. "They also took an interest in me as an individual — how I was trained in the resource as well as in the technical area. They didn't just want a technical person to sit in some room and work with the computers. I have an understanding of what people do, down to the ground level."

Helping Forest Service rangers in remote areas maintain a communications lifeline is just part of Steve Werner's job.

Werner, who began his technical career with the "Green Marines" in Sitgreaves National Forest in Springerville, Ariz., moved into his post in Washington, D.C. two years ago to take on national responsibility for managing telecommunications for the Forest Service. He manages the Forest Service's Computer Science and Telecommunications staff, which handles the acquisition and use of communications equipment and services.

While he has direct control over a staff of nine, Werner also serves as an advisor to the service's line managers. In this capacity, he formulates telecommunications policy. "Whatever happens in telecommunications, I'm involved in some way," he explains.

Werner sets telecommunications



direction for line managers in the field but has no authority to give orders. Instead, he works with top line management — the chief of the Forest Service or an associate deputy chief — to secure their commitment for telecommunications projects. He decides what levels of communications capability to

maintain in different areas of the organization, ensures that federal regulations specifying how agencies are required to conduct business are carried out and advises other parts of the organization on communications equipment selection and frequency management.

Continued on next page

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With expertise in both computer science and communications, Werner straddles the voice and data communications fence easily. "I'm a computer type, although communications is my broadest and first love. Electronics was my childhood hobby," he says. He gained his technical expertise during a 10-year stint in the Coast Guard, where he worked with "everything from shipboard to long-range aids to navigation stations." At the Forest Service, he manages voice, data and radio communications equipment.

Terrestrial microwave equipment connects employees in the national forests with their ranger districts, which are set up for radio communications. Where telephones aren't available, the Forest Service has some 40,000 mobile radios for public safety and law enforcement. It also provides communications for fire fighting and other emergencies and supplied communications at Three Mile Island during the nuclear power plant's accident. "We're geared to supply communications in remote areas. Most of this stems from our fire-fighting capabilities," Werner says.

Werner also manages all radio communications and frequency management for the Department of

through DG's Comprehensive Electronic Office software. Roughly 270 of the MV series minicomputers are linked to Telenet's network via 9.6K or 4.8K bit/sec leased lines. Some 300 remote sites with

massive project was made by top line managers, rather than technologists," Werner says. "Automation was sneaking in the back door; word processors came on the scene, and suddenly everyone

We knew we wanted to network the computers, but we didn't know how to do it. We included X.25 as a part of the contract and thought about all kinds of elaborate schemes. But we already had a contract with Telenet through the Department of Agriculture, so we asked them about X.25. I think we've done the right thing," Werner adds.

Although the project was initiated by line managers, not all managers welcomed the change at first. "The idea was to put the equipment in the hands of top managers from the very beginning. We had some problems with people who didn't want to adapt. But now every top line manager, from the chief of the Forest Service on

"Automation was sneaking in the back door; word processors came on the scene and everyone wanted one."

less traffic will be linked to Telenet's Public Data Network via Equatorial Communications Co.'s very small aperture terminals.

"The decision to undertake this

wanted one. We did a study to find out what the organization's computing needs were, and from that came the DG contract.

"The network came about later.

Where telephones aren't available, the Forest Service has some 40,000 mobile radios for public safety and law enforcement.

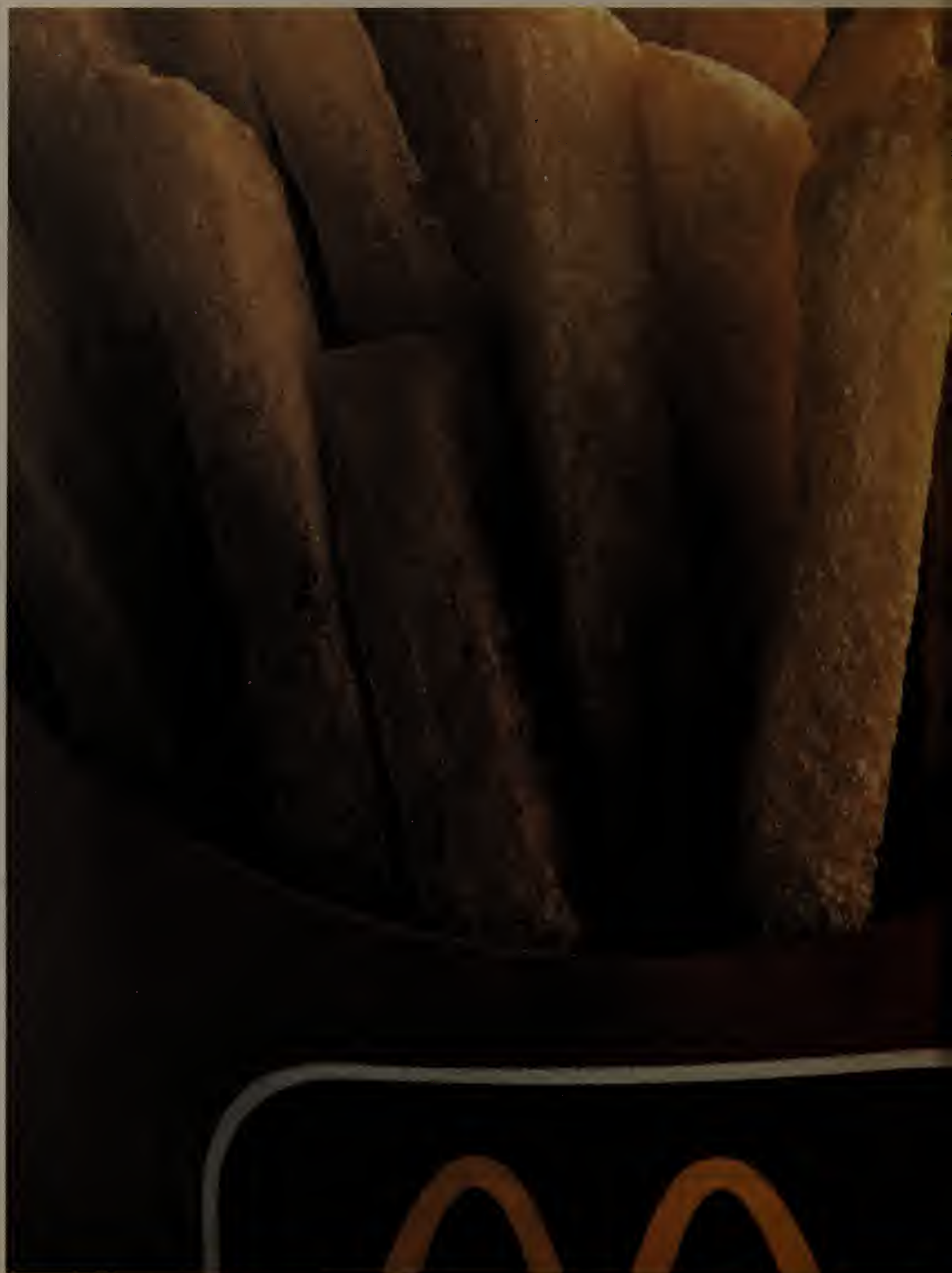
Agriculture and is a representative to the National Telecommunications and Information Administration's Interdepartmental Radio Advisory Committee.

On the voice side, Werner manages private branch exchanges in most of the 600-plus ranger district offices and 124 forest supervisor offices, as well as the Forest Service's nine regional offices.

Forest automation

Most of Werner's data communications responsibilities — and half of his time — revolve around a large-scale office automation project. The Forest Service is in the process of installing and linking Data General Corp. minicomputers at 1,000 locations via Telenet Communications Corp.'s public packet network.

The network, which will connect nearly all of the 1,000 sites, will link minis in regional offices, experiment stations, forest supervisor offices, ranger district offices and a few special units such as the forest products laboratory. Some 750 sites have installed minicomputers, which provide users with office automation capabilities



down, knows how to use the equipment and is very enthusiastic about it. If you took it away now, they'd rebel," Werner says.

In deciding to implement one system for all users, the Forest Service wisely avoided compatibility problems, allowing the service to follow the information center management principles it espouses more easily. "We can mail short messages and documents of any size; we can move program files using file transfer; we can do just about anything in terms of communicating data, and it ends up being in the right format when it gets to the other end," Werner explains.

"Everyone is working with the same word processor, spreadsheets and so on. We can take anyone at

any level in the organization, bring them in to a place like a fire camp, set them down at a DG terminal, and they can function because they know what it is. There's no learning curve. It's as familiar as

that run IBM and Sperry Univac Mini-computer Operations mainframes. "The communications front ends for the large mainframes were also programmed to communicate using software simi-

"Everyone knows the equipment and is very enthusiastic about it. If you took it away now, they'd rebel."

the Forest Service badge," he adds.

Data stays in the right format even when users communicate with the computing centers in Ft. Collins, Colo., and New Orleans

lar to DG's Xodiac, so they understand what's coming — in terms of files being transferred," Werner says. "Any user at a terminal can ship his information to the center,

and the information will automatically come back and be put in a magnetic drawer and folder, instead of printing out.

"The beauty of it is that we developed a way of connecting into our computer centers using X.25 and developed the necessary protocols, staying as close to the [International Standards Organization] standards as we could. We built applications that know how to talk to Xodiac," he continues.

Although the project began before Werner took his current post in Washington, he was involved earlier as a member of the benchmarking team that evaluated proposals. As a part of that team, he was responsible for helping define the telecommunications and remote terminal emulation aspects of the project's request for proposal, and he helped defined how the equipment would function. "I also helped out with other aspects — we all mingled in terms of what we tested," Werner says.

Sharing successes

Because of his strong sense of fairness, Werner is quick to give others, especially those who work for him, credit for their contributions. "I'm a team player," he says. "I made a contribution, and I'm glad that I was a part of it, but a

What ISDN is doing for McDonald's data networking capabilities is no small potatoes.

When McDonald's Corporation took a hard look at its telecommunications needs a few years ago, it saw 9400 restaurants in 46 countries, served by more than 20 networks. And a new restaurant opening every 17 hours.

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Thanks to ISDN, McDonald's will enjoy better customer service, more current market information, better tracking of product promotions, more efficient inventory control, and reduced administrative workloads.

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The right choice.

"We can take anyone in the organization, set them down at a DG terminal and they can function."

lot of people made contributions."

While he doesn't hesitate to become involved in various aspects of the project and to take on responsibilities for other areas, Werner also knows how to delegate responsibility where necessary, both with his staff and with outside contractors. In the office automation project, for example, Telenet handles network maintenance and supplies most of the communications equipment, including the modems that connect the minicomputers to the network.

"We've had to live with cutbacks and do more with less," Werner says. "Realistically, in trying to cut back people, we're more dependent on contracting things out. We're able to stay out of managing and maintaining this huge network — we've left that to the vendor — and I think, in the long run, that's paid off. We also have one contact point," he says. The cost of this independence isn't cheap, however. The Forest Service spends some \$750,000 per month on Telenet.

Werner's willingness to delegate responsibility makes him a good fit in an organization that emphasizes

Continued on next page

From previous page
decentralized decision-making. "I try to pull people in who are capable and then give them as much rope as they can handle. I look at it more as the people I work with, rather than a boss/employee relationship. I try to allow them to feel good about what they do and let them take credit for what they do. One of the biggest mistakes in management is when a person tries to stay in absolute control. What happens is that the manager becomes too strung out."

The minicomputer network makes quick, decentralized decision-making possible by providing information to managers when they need it. "By using the electronic office, we can turn docu-

ments and projects around much faster. We have to make a lot of resource decisions, dealing with Congress, dealing with people who use the national forests, timber sales. We need to be able to respond

to network it together, the investment just doesn't make any sense, especially if you're talking about information management. A person with a PC may have valuable information on a floppy disk. But if

ner says.

"We want the information we have to be available to the people who need it in the organization, and we don't want to recreate it 50 times or more," he continues. "What we do makes sense in terms of the way the organization operates. Managers, not technical people, decide how the organization operates. Computers to us are no more than shovels are to fire fighters — they're just tools."

Change difficult

The minicomputer network takes up about half of Werner's time now, but that's shifting toward radio communications and frequency management. In 1988, as a result of the government's Federal Telecommunications System 2000 system, Werner says, the emphasis in his work will move to working with the telephone system. "Shifting gears is difficult, but, as time passes, I'm getting better at it. A lot of that has to do with having good staff people."

As for his own future, Werner says he is content now, as long as he continues to grow. Until the next promotion, or until it's time to move on, he'll work to bring the next line of managers along. "If I want to move in the organization, then I have to train someone to replace me. I think about the past — the mistakes I've made and how people have misused me, and I try to improve on those things." □

"One of the biggest mistakes in management is when a person tries to stay in absolute control."

quickly, and we can do that," Werner says.

"You can have a lot of computers and other equipment sitting out there, but if you don't have a way

that person throws the floppy in a desk drawer, what good is it to the organization? That's the basic premise that we operate on — we don't want that to happen," Wer-



"... *Network World* clearly stands head and shoulders above the competition. One big reason is its networking focus."

Dick Hichens is Senior Technical Network Analyst for ALLTEL Corporation of Hudson, Ohio. The thirteenth largest telephone utility in the United States, ALLTEL provides cellular phones, wide-area paging services, fiber optic-based phone equipment and more to customers in 19 states. Dick is involved in purchasing ALLTEL's network communications equipment.

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Letters:

Editor:

This letter is in response to Robert S. Braudy's opinion column (NW, Aug. 24) in support of the Federal Communications Commission's proposal to require enhanced service providers to pay an access fee. Braudy outlined how these new charges will only minimally affect the groups currently using these services, including businesses, research libraries and home users. However, he ignores a small but critical segment of the market — education. Telecommunications is a very powerful way to increase student and teacher access to information, provide support services to teachers and administrators, foster communication with people around the country and around the world. Educational users simply cannot absorb increased telecommunications costs. The current fees for many commercial services already severely limit use of these systems in education. Braudy's support of the FCC proposal is short-sighted. Increasing costs will serve only to eliminate those we can least afford to disenfranchise.

Cecilia Lenk
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► TCA PREVIEW

Spotlight to shine on vendors' new offerings

BY JOSH GONZE
Staff Writer

SAN DIEGO — Of the 250 vendors exhibiting at next week's meeting of the Tele-Communications Association (TCA) here, several dozen are expected to introduce new products and services. Others will demonstrate the capabilities of existing products.

Teleprocessing Products, Inc. will participate in an on-line demonstration of IBM's NetView/PC, according to a spokeswoman. In the demonstration, alerts generated by Teleprocessing Products' net management software, the Multi-drop Network Management (MNM) system, running on computers in the company's booth at TCA, will be routed to a NetView/PC console at an IBM site in Research Triangle Park, N.C. Once it has received the alerts, the Raleigh console will pass them back across the U.S. to IBM's booth at TCA, where IBM terminal operators will display the MNM-generated alerts on a NetView console.

Teleprocessing Products is one of between five and 10 vendors planning demonstrations of their NetView/PC interfaces, according to a source close to IBM.

TCA sessions will offer strategies

continued from page 2

Prince Dyess said. "Most of the exhibitors will have engineering and technical staff to answer questions about product performance."

TCA's speaker roster is a mix of vendors, users, consultants and other communications gurus. Several speakers told *Network World* they plan to offer network professionals blueprints to follow in improving their management skills.

At the seminar titled "How to Gain Top Management Support," officials of Racal-Milgo, Inc. will highlight the dos and don'ts of winning senior management support for expensive telecommunications projects.

"We will show why network managers' requests sometimes go nowhere, why requests are shot down by top level management," explained Racal-Milgo spokesman Jack Hillhouse. The speakers will offer instruction in developing networking budgets and discuss techniques for clarifying the bottom-line benefits of telecommunications expenditures, Hillhouse said.

During another seminar, results of a study examining the problems of merging MIS and communications management will be revealed. Speaker Richard Livdahl, managing partner with Southwest Systems Associates, Inc., the management consulting firm that conducted the study, said, "Even in

Officials at IBM would not comment on the demonstration.

Paradyne Corp., which will also demonstrate a NetView/PC interface, will introduce an upgraded version of its Model 3056 channel service unit/data service unit designed to support digital data services that offer secondary channels for network management.

In addition, the company will announce a new 14.4K bit/sec modem that can consolidate traffic from three different telecommunications circuits. The highest single port speed is 9.6K bit/sec.

T-1 multiplexer maker **Avanti Communications Corp.** is expected to add a color-graphics interface to its stock of network management offerings. The new package, called Open Network Management System (ONMS), will provide an icon-oriented interface to help inexperienced users navigate their way through a network from the ONMS console.

The software runs on a Sun Microsystems, Inc. Sun-3/110 computer and supports customized report generation.

Racal-Milgo, Inc. will unveil three network management gateways that strengthen ties with IBM's NetView.

organizations in which a chief information officer has been named, we still have very separate and definable management structures for telecommunications vs. information systems. It appears to be more of an evolving, technology-driven integration, as opposed to a true information management orientation."

Livdahl will also announce plans to sponsor a "low-cost information exchange organization" for telecommunications professionals to discuss new management and technology concepts and exchange advice.

Users eyeing the application of artificial intelligence technologies to networking should consider an overview seminar organized by Ralph Love, a researcher at Bechtel Power Corp.

Love will demonstrate a prototype expert system developed at Bechtel to diagnose problems in micro-to-mainframe links. The seminar, he said, will "give attendees enough information so that they could be capable of building an expert system."

Telecommunications attorney Jack Landau said he plans to use his "Regulatory Update" seminar to help users understand current trends in Bell operating company regulation by explaining its history.

"It's like driving forward through the rear view mirror. I want to tell people where we're going by telling them where we've been," Landau said. ▢

CMS/View is a NetView/PC application that will transfer alarms from Racal-Milgo's network management products, the Communications Management Series (CMS), to IBM host-resident NetView. CMS/View also reportedly centralizes alarms and diagnostic files.

CMS Gateway 1 is a protocol converter for reformatting CMS data as NetView data, allowing a network operator to access the two concurrently. It has three operation modes: 3270 Systems Network Architecture mode, 3770 SNA batch mode and 3780 Binary Synchronous Communications batch mode.

Host-Link II is software that selectively retrieves and integrates network maintenance history and performance statistics from a CMS data base and transfers them to a central processing point, such as an IBM mainframe.

Omnifax Telautograph Corp. will introduce a portable facsimile machine featuring automatic operation and activity reports. The machine will operate with circuits up to 9.6K bit/sec and will fit into a briefcase-sized carrying case.

Northern Telecom, Inc. said it will be making product announcements related to its Meridian SL-1 private branch exchange but would not provide details.

Concord Data Systems, Inc. will take the wraps off a 9.6K bit/sec modem and two 2,400 bit/sec modems.

The higher speed modem, the 296 Trellis, is a full-duplex, synchronous/asynchronous modem compatible with the V.32 standard and designed for use on both dial-up and leased circuits.

The lower speed modems, the 224 Autodial Plus and the error-

correcting 224 Autodial Plus-E, are synchronous/asynchronous autodialing modems featuring automatic adaptive equalization to meet the remote modem's speed and modulation mode.

Gandalf Data, Inc. will undrape a data-over-voice unit called Dovtrex for Centrex-based local networks. Dovtrex operates at 64K bit/sec to combine voice and data over a single Centrex circuit.

Mitel, Inc. has scheduled a press conference at which it will make a "major announcement concerning its product line," according to spokesman Nick Bell. He would not provide details.

RCA Global Communications, Inc. will introduce telex access interfaces for Digital Equipment Corp.'s VMS operating system and IBM's CMS/PROFS running under the VM operating system. Both new software interfaces are part of the company's GlobeLink family of telex products.

Ceremtek Microelectronics, Inc. will introduce a 9.6K bit/sec trellis-coded modem supporting asynchronous communications over dial-up lines. Priced at \$1,595, the 9600 DA features a V.32 interface and complements the firm's two other V.32 9.6K bit/sec modems.

The new unit supports either the X.25 Bit Oriented Link Access Procedure or Microcom, Inc.'s Microcom Network Protocol error-correcting standard.

Supporting the Hayes Microcomputer Products, Inc. AT modem command set, the 9600 DA has a 4.8K bit/sec fallback rate and supports autodialing with a nonvolatile memory capable of storing 10 telephone numbers, each of which can be up to 40 characters long. ▢

IBM execs talk on NetView

continued from page 16

will need another CPU or more direct-access storage devices to support the terminals. So, did IBM really lose? No. IBM will win some business it would not win if SNA was closed.

Bailey: For example, a customer may have to devote one portion of its staff to manage T-1 lines, a second to another piece of the network and a third to the SNA portion. With eight pieces of equipment, it needs up to eight technicians to manage the network, and that is not a very economical way to run a business.

Analysts speculated that competitors may choose NetView/PC for the standard network management interface and use that interface to leverage sales of their own network management systems. Customers may have networks with many copies of NetView/PC and no copies of NetView. How does IBM view that scenario?

Drescher: That scenario is a possibility, and some companies are openly talking about doing that. Eventually, a customer needs a total network management system,

and we see NetView as our answer to that need. Customers may start without NetView but eventually will discover they need it.

Gleaton: NetView/PC supplies other vendors with a programming interface and a port that can be used to translate non-SNA protocols to SNA protocols. An inherent part of the scheme is sending SNA communications back to a central point, namely NetView. I am not sure how well a system would operate if you put something instead of NetView at the central control point.

How are customers revamping their staffs so they have sufficient manpower to manage their networks?

Bailey: Our customers are now looking at the management of the systems side of their data processing departments and discovering that tasks there are similar to tasks on the networking side. When the two groups talk to one another, they find they can help one another, and we are encouraging them to do that.

Drescher: You can multiply that by two because there are similar issues with voice and data. Companies are revamping the departments so they both report to the same director or vice-president. ▢

Northern targets private nets

continued from page 1

come available in stages beginning in the second quarter of 1988 and continuing through the year, has three major components: Meridian Network Services, Meridian Network Control and Meridian SuperNode.

■ Meridian Network Services, a range of custom-programmable software options, enables the Northern Telecom SL-1 and SL-100 private branch exchanges to support Northern Telecom's tandem network scheme called Electronic Switched Network (ESN), which has been enhanced to support ISDN Primary Rate and Basic Rate Interfaces.

Northern Telecom also enhanced its Primary Rate Interface to provide simultaneous support of clear-channel signaling, ESN signaling and standard T-1 signaling over the same link. This is said to allow existing T-carrier facilities and ESN trunk groups to be used in the transition to ISDN environments.

The new signaling capabilities will enable Meridian Network Service customers to support call-handling features across a network that were previously available only from a single switch.

These include features such as networkwide ring again when a busy signal is encountered and uniform numbering plans, as well as call waiting and call forwarding.

To display information now capable of being forwarded through a network, such as the telephone number of a caller, Northern Telecom introduced the Meridian M2317, a digital telephone with a 2-by-40 character display and programmable feature keys.

■ Meridian Network Control, software that runs on Northern Telecom's DVS processor, will be avail-

able in the third quarter of 1988. It provides diagnostic and alarm capability for Northern Telecom's and other vendors' switching products, as well as providing control of T-1 multiplexers.

Meridian Network Control establishes a base to integrate control of circuit and packet switches as well as public carrier transmission services, the company reported. It supports the Network Operations Protocol, which is based on the International Standards Organization's Open Systems Interconnect model but will also interface to other network management tools such as IBM's NetView.

Meridian Network Control provides integrated functions for configuration management, performance management, change management and problem management.

■ Meridian SuperNode, a specialized switch designed to support advanced applications, is the corporate network equivalent of the DMS-SuperNode introduced by Northern Telecom earlier this summer ("Northern enhances CO power," NW, July 13).

SuperNode, which works in conjunction with Northern Telecom SL-1 and SL-100s and other vendors' switches, can be configured as a centralized data base-controlled feature node to support advanced private network functions, such as corporate 800 service and corporate travel card service.

These services are made possible by using SuperNode in conjunction with remote corporate network switches. A corporate 800 call would, for example, be screened by a local exchange carrier and routed to the nearest corporate network facility, from which point it would

be carried on net to its destination. Corporate travel card services are provided in the same manner; traveling employees dial an access number and hop onto the corporate network at the nearest point of presence.

Both schemes would provide "significant savings for the large corporate customer," Northern Telecom said.

The Meridian Network Control capabilities and Meridian SuperNode will be available in the third quarter of 1988. Northern Telecom officials said that later this year, the company expects to announce agreements with other vendors to supply application processors that would further enhance features available through Meridian Customer Defined Networking.

As part of the networking scheme, Northern Telecom announced an OEM agreement with Digital Communications Associates, Inc. (DCA) to market DCA's System 9000 T-1 multiplexer. In addition, Northern Telecom announced plans to make network design and optimization tools and training available to third-party systems integrators.

Although Northern Telecom had originally said that systems integrator Electronic Data Systems Corp. (EDS) would attend the press conference, EDS canceled at the last minute. The two companies were unable to finalize their agreement in time for the press conference, a Northern Telecom spokesman said.

An announcement of the agreement is expected to be made soon, and Northern Telecom sources said EDS is scheduled to install Meridian Customer Defined Networking services for one of its customers. EDS is the systems integrator for the new General Motors Corp. backbone network. □

CALENDAR

Sept. 22-23, New York — The Effective Delivery of Enhanced Consumer Communications. Contact: The Yankee Group, 200 Portland St., Boston, Mass. 02114.

Sept. 22-24, Dallas — Ninth Annual Satellite Communications Users Conference (SCUC). Contact: SCUC '87, Satellite Communications Magazine, Suite 650, 6300 S. Syracuse Way, Englewood, Colo. 80111.

Sept. 28-30, Chicago — National Communications Forum '87. Contact: National Communications Forum, Suite 4808, 505 N. Lake Shore Drive, Chicago, Ill. 60611.

Sept. 28-Oct. 3, San Diego — 25th Annual Tele-Communications Association (TCA) Conference. Contact: TCA Annual Conference, TCA, 1515 W. Cameron Ave., B-140, West Covina, Calif. 91790.

Sept. 29, Minneapolis — Effective Project Management. Also, Oct. 8, Boston. Contact: Business and Professional Research Institute, 1700 Post Road, Fairfield, Conn. 06430.

Oct. 5-6, San Francisco — The Fourth Annual Third-Party Maintenance Conference. Contact: Customer Service, Frost & Sullivan, Inc., 106 Fulton St., New York, N.Y. 10038.

Oct. 5-7, Bal Harbour, Fla. — Pay Phone Expo '87 East. Contact: TeleStrategies, Inc., 1355 Beverly Road, McLean, Va. 22101.

Oct. 12-15, Washington, D.C. — Telephone Technology and Practice. Contact: ABC TeleTraining, P.O. Box 537, Geneva, Ill. 60134.

Oct. 13-14, Dallas — VAX Users Show Exposition & Conference. Contact: The Producers, 360 Merrimack St., Lawrence, Mass. 01843.

Oct. 14-15, Newport, R.I. — The Newport Conference on Fiber-Optic Markets. Contact: Newport Conference on Fiber-Optic Markets, KMI Corp., America's Cup Ave. at 31 Bridge St., Newport, R.I. 02840.

Oct. 18-21, Phoenix — Systems Integration: The Business Challenge. Contact: Marcia Farrington, International Data Corp., 5 Speen St., Framingham, Mass. 01701.

Oct. 19-21, New York — Systems Network Architecture: Architecture, Products and Current Implementations. Also, Oct. 22-23, New York; Nov. 16-18, San Francisco; Nov. 19-20, San Francisco. Contact: Information Breakthroughs, Inc., 445 West Main St., Wyckoff, N.J. 07481.

Oct. 26-28, New York — The VAX Business User Forum. Contact: Dorothy Ferriter, IDG Conference Management Group, P.O. Box 9171, Framingham, Mass. 01701.

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ISDN ventures into LAN territory

continued from page 1

separate wiring systems for voice and data networks, the flexibility ISDN would provide by integrating voice and data and the reduced equipment requirements it promises, most ISDN experts and communications vendors believe ISDN will not compete with or replace local networks.

"ISDN is not a threat to local networks," Darrell Miller, director of marketing for local network maker Ungermann-Bass, Inc., said flatly. He conceded, however, that there may be some overlap in the networking capabilities of ISDN and local networks used to support lower speed terminal-to-host connections. But the market is moving away from such applications, he said.

Trends in the market indicate that personal computers are becoming the workstation of choice and more graphics-oriented applications that require a lot of memory and bandwidth are becoming popular, according to Darrell Miller. "Only LANs can satisfy the throughput requirements of these applications," he said.

Others, however, say that there are plenty of instances where a lower speed, connection-oriented ISDN link could adequately serve users' intrabuilding data communications needs. "If you look at LAN users, the vast majority of them don't have the stringent high throughput and low delay requirements that LANs offer," said Joe Miller, director of ISDN technology development for US West, Inc.

The debate revolves around whether ISDN, developed primarily for wide-area communications, is appropriate for serving data communications needs within a single site. Although ISDN supports packet switching, it is oriented toward circuit-switched point-to-point connections. In comparison, local networks provide logical connections on demand.

ISDN digital telephone-type networks integrate voice and data and provide universally standard network interfaces for a variety of equipment.

Although ISDN describes two standard access interfaces, only one, the Basic Rate Interface, applies to desktop-to-desktop intraoffice communications.

The Basic Rate Interface, as supported by Centrex services and private branch exchanges, enables one telephone station cable to support two 64K bit/sec digital B traffic bearing channels for voice and/or data, and a third 16K bit/sec D signal channel. The D channel of the so-called 2B+D interface controls the B channels.

Desktop devices, including telephones, computer workstations and facsimile equipment, will be linked to 2B+D interfaces with a terminal adapter that multiplexes the three channels onto a four-wire twisted-pair cable.

Thus, the Basic Rate Interface would enable workstation users to establish dial-up-type connections

to other PBX-attached devices, a function similar to the capabilities offered by data switches today.

Unlike local networks, digital PBXs in this scenario require that users dial up and wait for data connections. "ISDN, in its current form, is based on the idea of making connections between points that are going to communicate, whereas in a LAN, you have these logical links where data is simply put on the link and it ends up at the right place," US West's Joe Miller said.

Such point-to-point connections prohibit the broadcasting of messages across a network, which limits the usefulness of applications such as electronic mail.

More central to the debate, however, is whether the 64K bit/sec data rate of a single ISDN channel is adequate for applications such as file transfer, resource sharing and host access, which are typically supported by local nets. Although the actual throughput of local nets such as Ethernet is much lower than the 10M bit/sec operating rate, it is still greater than 64K bit/sec.

According to Eric Kalin, an AT&T district manager responsible for PBX peripherals, it is more than adequate. "For the average white collar worker, 64K bit/sec is more than they can handle. A fast typist can only type at 30 bit/sec and reading takes about 1,200 bit/sec — 64K bit/sec is 50 times faster than that," he said.

Others maintain that for large file transfers, the 64K bit/sec rate is not adequate. "The basic access rate can't keep up with LAN applications common today," said Paul Masters, manager of local network market development for Northern

Telecom, Inc.'s Meridian Business Systems division. "File sharing and electronic mail require high speeds and the ability to broadcast information."

ISDN data switching may compete more closely in throughput with local networks used to support terminal-to-host connections. Connections between a terminal and terminal server in this environment are typically 19.2K bit/sec, although the connection between the terminal server and host is typically a high-speed connection.

"For us, ISDN will standardize the lower circuit speeds we use today in linking terminals to hosts," said Ungermann-Bass' Darrell Miller. "That's where there will be overlap."

Hand-in-hand with the speed issue is the question of whether digital PBXs will be capable of handling a higher volume of data switching on top of voice switching. Kalin said he believes that there is capacity to spare in digital PBXs for data switching, but others disagree.

"In the short term, users have to make some serious decisions about the nature of their data communications requirements and on the capacity of their switches," said Mary Johnston, a senior consultant with BBN Communications Corp.'s telecommunications consulting group.

"It should be interesting to see in the next five years whether users opt for the more circuit-switched type environment of PBXs or whether they continue using LANs until ISDN standards catch up with LANs. But the whole ISDN implementation effort is going to be very long," she said.

"It goes back to the ongoing PBX/LAN war in terms of who should control premises-level data

switching," Johnston said. "In the short term, ISDN may not help very much. It helps eliminate some of the wiring, so for very light users of data switching, it's probably attractive to use an ISDN PBX and not have to cable a LAN. I think choices will be made based on what the user population looks like and what the trade-off is — installing wiring twice vs. giving users limited throughput in a switched environment," she said.

Potential synergy

Despite the debate swirling around the roles of local nets vs. PBXs, most ISDN observers agree that there is a potential synergy between ISDN and local networks, perhaps in using ISDN to move data between networks.

"ISDN is fundamentally a set of transport standards for wide-area networks," said Ian Angus, president of Angus TeleManagement Group, Inc. in Toronto. "LANs solve the need for single-site high-speed communications and will continue to do that, but LANs are weak in going to public networks. ISDN will be used to link LANs at multiple locations."

Just what that link will look like, or whether it will be a standard compatible with several types of local networks, are questions yet to be answered. Unfortunately, ISDN standards don't fully define how the different environments will be interfaced, according to Johnston. "There is work going on in that area under the sponsorship of ANSI, but it's not a high-priority issue," she said.

"The long-term picture is good for ISDN being able to support local nets," Johnston said. "But the work won't be done in time for the 1988 plenary. It will be 1992 before we have international approval on that standard." □

Codex unveils net manager

continued from page 2

The operator can also perform a variety of tests, such as loop-back tests, to determine the source of a problem. The product's trouble-ticket facility tracks how much time passes before the problem is resolved.

The 9800 INMS also collects and depicts performance information, such as how many bytes of data pass through a multiplexer during a certain period of time. Codex pledged to include a response time monitor that will display transaction times in a future release of the 9800 INMS.

Analysts were generally impressed with the Codex product. Eduardo Stecher, president of Communications Associates, Inc., a consulting firm based in Natick, Mass., noted that the 9800 INMS has the horsepower needed to manage a large multivendor network and an architecture that will enable it to be linked with other vendors' systems.

However, analysts expressed reservations about Codex's ability to succeed in the increasingly com-

petitive integrated network management market. IBM, Timeplex, Inc., Network Equipment Technologies, Inc., Digital Communications Associates, Inc., US West Network Systems, Inc. and Avant-Garde Computing, Inc., have all announced strategies similar to Codex's. Heavy hitters such as AT&T and Digital Equipment Corp. are also expected to enter the network management fray soon.

Thus far, only IBM has been successful in convincing other vendors to support its approach. More than 25 vendors have announced plans to link their network management products to NetView, IBM's host network management system, through IBM's NetView/PC. Companies like Codex will have to garner similar support if they hope to position themselves as leaders in the network management market.

Codex officials grudgingly acquiesced to the ground swell of NetView support. Jonathan Gossels, senior product manager for network management at Codex, portrayed standards based on proprietary products as inherently biased and unstable. Despite those shortcomings, Codex pledged to

link the 9800 INMS and the company's 4800, a network management system for Codex diagnostic modems, to NetView through NetView/PC.

Analysts said they were concerned about Codex's ability to deliver on its promises. "Products always look good during a demonstration," noted Barry S. Gilbert, executive vice-president at The Market Information Center, Inc., a market research firm in Marlborough, Mass. "The key is how well they perform at customer sites."

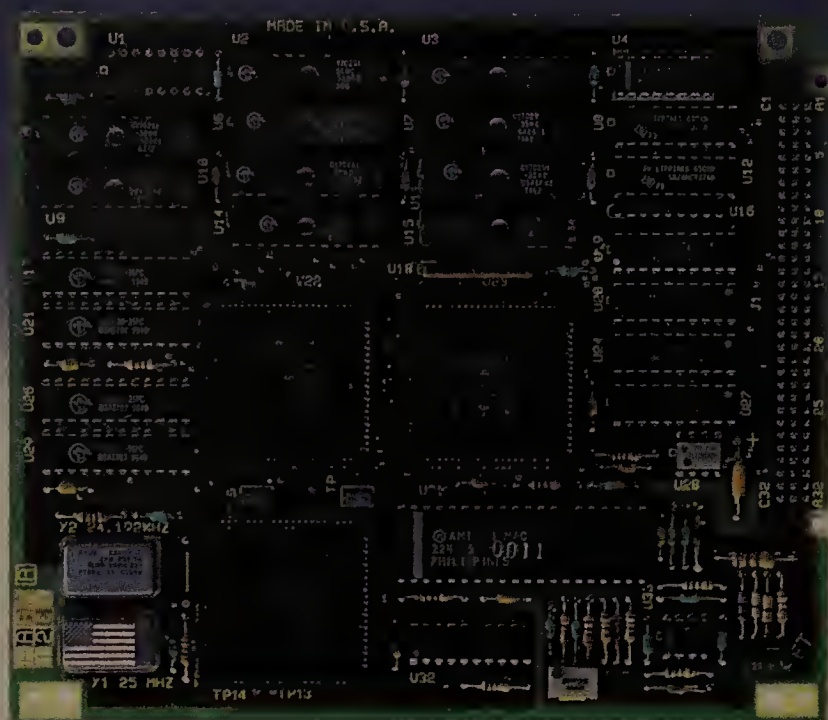
Another concern was that the OSI network management standards Codex is touting are in only an embryonic phase of development. Codex officials said work on the standards will be completed in approximately two years, but analysts pegged the time frame at four to five years.

"AT&T got burned once by moving on a standard before it was formally approved, and Codex could have the same problem," said Jeremy Frank, program director at Gartner Group, Inc., a market research firm in Stamford, Conn.

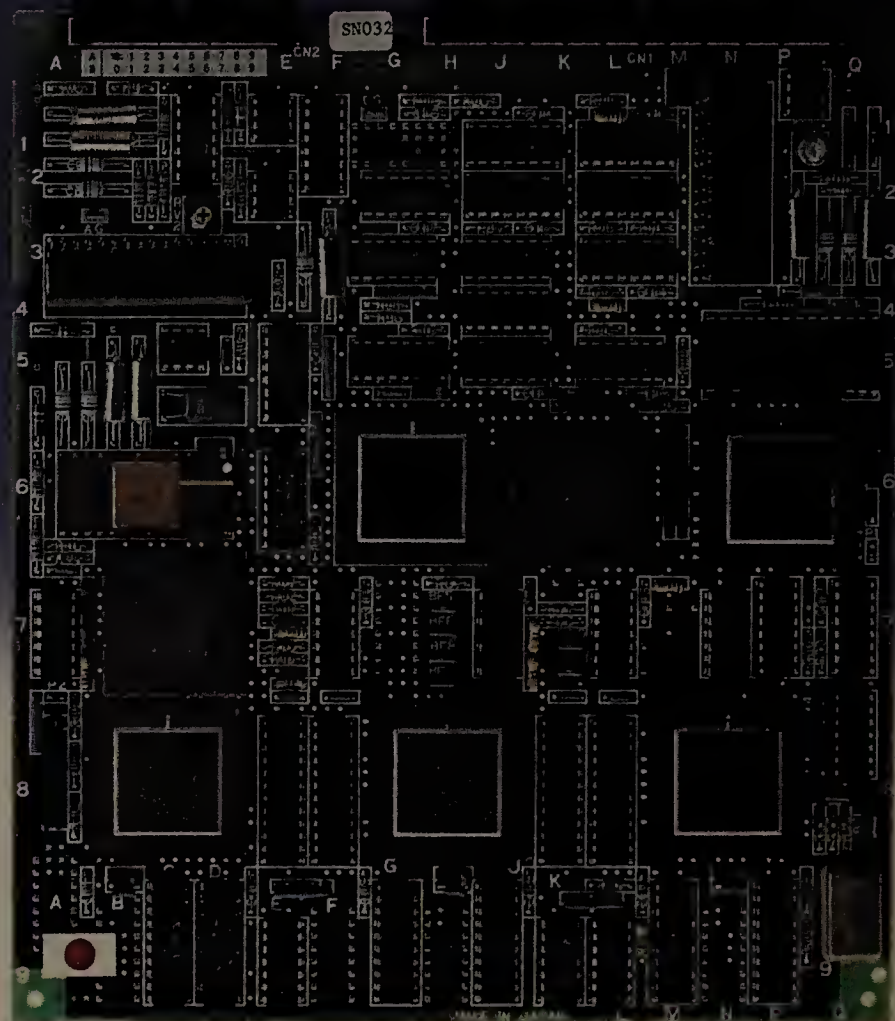
Will Collins, a Codex engineer, is the U.S. representative on the ISO net management subcommittee. □

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